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Success a Certainty, If—

FROM the point of view of the electrical industry at large, the chief problem before us now relates to the loading of the national grid within the next few years. Most of the proposals that are occupying the attention of the electrical public are directed to this end.

The completing of the construction of the grid a few weeks ago and the starting of trading by the Central Electricity Board in certain areas earlier in the year have given chairmen of the I.E.E. Local Centres an apt subject for their inaugural addresses this session. Both Mr. B. Welbourn, at Liverpool, and Mr. G. G. L. Preece, at Manchester, on Monday took advantage of the opportunity to review the prospects of increasing electrical loads of different classes in the early future; both concluded that omens are favourable to the success of the grid, and that consequently the outlook for manufacturers and employment is bright.

We believe that their anticipations will be justified, for, as Mr. Preece said, the proper development of the domestic load alone should ensure this.

Mr. Welbourn's address will be a useful data source, as he gives statistics of present conditions in the chief applications of electricity and his reasons for estimating the number of kWh sold in 1941 at 22 thousand million—twice the amount sold now, and five per cent. more than the original estimate made by Sir John Snell.

These figures seem to us conservative, but not unduly so, although we should expect a somewhat greater increase than 140 million kWh in steel-making. He excludes main-line electrification, but allows for an increase in the electrical requirements of suburban railways by about 50 per cent., which appears to be safely within the bounds of possibility.

During the past four years the rate of increase in consumption has declined, due to trade conditions. Is Mr. Welbourn justified in assuming that the average proportional increment for the next eight years will equal that of the past eight years?

We think he is. Apart from some advantages of grid supply which should stimulate growth of load, even in the earliest years, there is evident a more active spirit on the part of distributing undertakings—and upon this ultimately everything depends. There will be the cumulative effect of satisfaction given by electrical methods, whether in the factory or in the home. Not least will be the insistence of the public on a first-class service, and this will of itself encourage growth of load.

Fulfilment will not come automatically. It will need every ounce of effort we can all of us put into the work of securing load. But succeed it must. We have spent vast sums on the national scheme. So far it has enhanced our reputation abroad and given us valuable technical experience at home. We do not think Mr. Welbourn exaggerates when he says that the national honour of Great Britain is concerned in its success.

An Electrical Centre

IT is impossible closely to assess the value of the Building Centre to the electrical industry from the report just received from the directors. It was started with the best possible intentions, but, seeing that as many as 1,000 firms are represented, it obviously forms so varied a collection of building materials that electricity can only have a small share either of the glory or of the actual business resulting. What is the verdict of the electrical exhibitors regarding business done now that the first year is ended? We learn that during that period 100,000 visitors took away 126,000 standardised information sheets regarding exhibits; and we note that the directors record thanks to the Electrical Development Association and the British Commercial Gas Association for their respective composite exhibits and the assistance of their technical representatives. But the Building Centre and its specialised activities amongst architects and builders and their clients cannot be used

as an argument for side-tracking any scheme for establishing an impressive Electrical Headquarters for the electricity supply industry in London. For years we have advocated the opening of a big central electrical showroom and information headquarters for the metropolitan area. Let us combine this idea with our recent suggestion that E.D.A. should forsake Savoy Hill, and use part of its new premises on the street level for a brilliant and very practical demonstration that may be seen by hundreds of thousands of people every day and night. At present we have a Lighting Service Bureau, a Building Centre, an Electrical Housecraft School, and a suite of E.D.A. offices. What about a consolidation scheme?

Reasons for Delay

WHEN things do not work out according to plan there is a disposition to search for a scapegoat. But those who pursue such a pastime have nothing to gain therefrom and it will bring no advantage to the industry. The atmosphere at the final meeting of the Electrical Development Association held just before the summer holidays did not convey to the minds of men with accurate knowledge of the situation any idea that the reorganisation process could rapidly remove all difficulties. Perhaps hopes and aspirations blinded some enthusiasts to the lions in the path. Some time had to elapse before the new Council could be appointed, and when this was done it did not automatically fill the coffers with funds or solve the problem of personnel. The promise of an autumn campaign gave rise to the belief that a scheme was already cut and dried. But, after all, in view of the difficulties, patience is of great importance if mistakes are to be avoided.

Who is the Man?

LOOKING backward over a lengthy period we feel that the electrical industry has seldom, if ever, had to face so difficult a problem as has lately presented itself with regard to the personnel of the changed organisation. When a search is being made for a man qualified electrically and by personality to lead us on to victory, or die in the attempt, we may endanger the good of the cause by being in too great a hurry. Those whom we may think most suited to the post shrink from a task which, after all that has been said about the work that lies before E.D.A., appears to be one carrying overwhelming responsibility. The thought that the appointment of the wrong man may frustrate the chances of drawing all interests into a harmonious group is about the only consideration that justifies delay. Many names have been mentioned in our hearing and in the Press which have left us lukewarm. Perhaps we may know something definite as the outcome of the Council meeting which is taking place to-day. At the moment of going to press our one anxiety is that the appointed chairman shall be a man whose record is such as to secure our enthusiastic confidence and support as an industry.

Newspaper Advertising

WE welcome the Autumn Press Advertising Campaign of E.D.A., which began to make itself felt at the end of last week. We give some particulars on a later page in this issue, and urge every electricity supply undertaking to devote serious attention to it. A series of new advertisements, "The Wizard in the Wall," published in various London newspapers is designed by word and picture to sell the general idea of electrical service obtainable from the touch of a switch. The object is to dispel prejudice, to counter-attack innuendo, and to create a receptive frame of mind in the public towards electricity. This initial campaign is described as a double-digging of the ground "in preparation for next year's sowing." We are not impressed by this reference to "next year's sowing." Surely we are at that stage now! We look for part of the harvest next year. The public is advised to visit electricity showrooms, and managements of undertakings are urged to have in their service active sales and demonstration staffs. We commend this new publicity effort, whoever may be responsible for it, to everybody's sympathy. It is but the beginning of great things we believe, and we hope that more widespread efforts will soon follow.

E.P.E.A. Technical Groups

THE London Technical Group of the Electrical Power Engineers' Association opened its session last Tuesday with a paper by Mr. J. W. Abernethy on power station auxiliaries, which nowadays must be as reliable as the main plant. The subject had been well thought out, and the author's remarks on motor control were especially noteworthy. There has always been a sound tendency at these technical group gatherings for the discussions to be of a really practical character and for members to speak their minds openly. The meetings provide a rendezvous for manufacturing and operating engineers that is of considerable advantage to both parties; the former hear of their shortcomings, and the latter have any excuse for complacency taken from them.

The Better Way

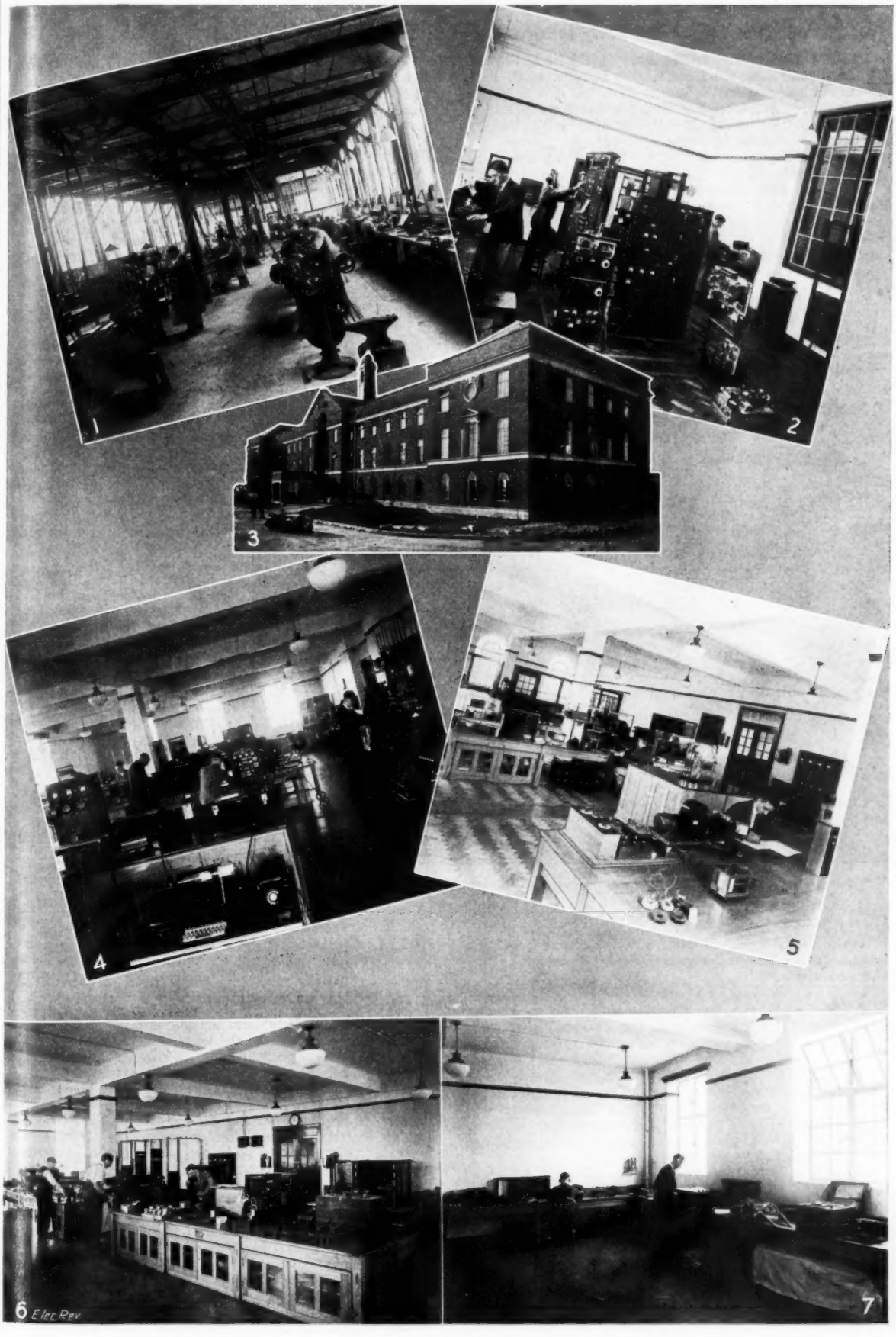
DURING the past few days there has been some discussion in the lay Press regarding the alleged competition between electricity and coal. Actually electricity provides the best means of getting the product of our coalfields to the people. Taking the thermal efficiency of Clarence Dock power station at 24.72 per cent. with coal having a calorific value of 11,800 B.th.u. per lb., and assuming 6 per cent. of the energy generated to be used by auxiliaries and 21.7 per cent. lost in transmission and distribution (the average figures for the whole country), there are 2,370 B.th.u. available for heating a room from every pound burned under boilers. This is not very far different from the effective 2,520 B.th.u. obtained by burning a pound of raw fuel with a calorific value of 14,000 B.th.u. per lb. in a domestic grate with an 18 per cent. efficiency. This small apparent increase in the amount of coal necessary is counter-balanced by the economy due to the control possible with electric heating. On the other hand, more (electric) heat units will be consumed in rooms in which a coal fire is never lighted on account of the labour involved.

Horses Must Go!

COLONEL CROMPTON does well to draw attention in the Press to the hours wasted in the London streets due to the use of horse-drawn vehicles. His view that the battery would provide an economical and efficient substitute for the horse is entirely borne out by those who have had experience of the electrical method. Battery haulage, particularly for work involving frequent stops, is cheaper than horse haulage, is clean, and does not hold up the traffic. The noise caused by horse-drawn lorries is another objectionable feature that is eliminated; we believe it was largely this which influenced the St. Pancras Borough Council to adopt electric dust-carts. In Birmingham, where all refuse is collected by electrically propelled vehicles, and where over £50,000 has been saved per annum by doing so, its economy and reliability have been quite definitely proved. The same considerations apply to any vehicles engaged on short-distance work for which the horse has hitherto been regarded as the most suitable. The energy consumption for the 3½-ton vehicles in Birmingham is only 2 kWh per mile and the running costs about 2s. 3d. per ton load.

Forestalled!

ON page 584 reference to points on a curve leads (by pure chance) to the expression "will follow the line EDA if the change is slow." We merely mention this to stem the flood of humour which would otherwise overwhelm us through the post.



The G.P.O. Research Station, Dollis Hill (See next page)

(1) The metal workshop. (2) The short-wave and ultra-short-wave radio laboratory. (3) A general view of the buildings. (4) The telegraph laboratory. (5) The physical laboratory, with h.v. annexe behind glass partition. (6) The line transmission laboratory. (7) The cable research laboratory, showing apparatus for detecting submarine cable faults

Post Office Research

The new laboratory buildings at Dollis Hill

AFTER twelve years' unobtrusive work in a collection of wooden huts, the General Post Office research staff has at last been housed in a group of fine new buildings at Dollis Hill, N.W.2, more in consonance with the importance of an organisation which is internationally recognised to be among the foremost of its kind.

On Monday afternoon Sir Kingsley Wood, the Postmaster-General, welcomed a large gathering of distinguished guests in the lecture hall, commenting on the co-operative spirit of mutual help that existed between the British and other research organisations of the world. Capt. B. S. Cohen, staff officer in charge of the G.P.O. research station, read a congratulatory telegram from the International Consultative Committee on Long-distance Telephony, and briefly outlined the very wide range and variety of the investigational research carried out at Dollis Hill.

The Rt. Hon. J. Ramsay MacDonald, the Prime Minister, in performing the opening ceremony, said it was a proud thought, not silly or vain patriotism, that British engineers had done so well that to-day London was the most conspicuous of all the capitals in the progress and application of electrical science. Capt. H. Leigh Mossley, chairman of the Willesden Urban District Council, proposed, and Lt.-Col. A. G. Lee, engineer-in-chief of the G.P.O., seconded, a vote of thanks to the Prime Minister. Tea was served, and the various laboratories were open for inspection during the afternoon and evening.

The construction park at Dollis Hill where men are trained in handling line equipment

Designed by Mr. A. R. Myers, senior architect, P.O. Services, H.M. Office of Works, the buildings are of the modernised Georgian style, which seems to be the P.O. standard. They are brick faced with stone ornamentation, giving them a character of sobriety, the skill with which metal-framed windows have been reconciled with a traditional style being noteworthy. The main front block is rectangular, of dumb-bell shape, with an attic under the roof illuminated by sky-lights concealed by a parapet. The ground-floor windows are round-headed and those above square, except in the wings, where the topmost are circular.

Behind is a centre block used entirely for services, power, heating, dining, photographic, &c., with a large lecture hall above. On either side there will eventually be three flat-roofed blocks like the teeth of a double comb in plan. At the rear is a separate block for a training school, which provides twenty-five courses for students, including specialised courses for workmen and refresher courses for engineers.

Finally, there is an outside constructional park of 12,000 sq. ft., partly used for research in external overhead and underground line construction, and also for training men and youths in handling tools and appliances needed for constructional and maintenance work.

Covered ways connect the various buildings, cables and other service mains being carried between their ceilings and roofs. Floors are rubber-covered throughout, and Empire wood panelling is used effectively. The accommodation provided includes administrative offices, a library, and drawing office; telegraph, telephone, cable, physical, chemical, and radio main research and testing laboratories; besides plating, millwrights', woodworking, machine, coil-winding, and assembly shops, stores and garages.

The Importance of Acoustics

In a building such as this, concerned largely with problems of sound, acoustics is of major import, and numerous ingenious devices, materials, and methods have been used to suitably condition a series of rooms for the investigational work carried out at the Dollis Hill laboratories, which deal with the development from basic principles and fundamental measurement of all matters pertaining to the science of electrical communication, besides problems encountered in the daily operation of the telegraph and telephone services.

In addition, new entrants to the engineering branches are given instruction of an intensive character to enable them to correlate any specialised activities on which they may later be employed to the general organisation of the G.P.O. The work of the laboratories is organised in eight main groups. For instance, the transmission line group investigates trunk and toll-circuit problems, and transmission through submarine cables and international circuits. The echo suppressor, which made long-distance trans-Continental telephony possible, was devised at Dollis Hill, and an improved model will shortly be available. The United Kingdom trunk circuits were the first in the world to operate with zero transmission loss; a new submarine cable fault locator has been put into use, and the work of this group resulted in the development of the eight-pair Anglo-Dutch cable, with twenty telephony channels.

Similarly, in the testing laboratories durability and life tests of automatic telephone equipment enable thirty years of normal operation to be simulated in a few weeks.

Subscribers' Loud-speaker Sets

To meet a growing demand for telephones which do not require to be held during conversation, three types of microphone and loud-speaker equipment have been developed, and supplies are now being obtained. With Type A the user speaks close into an ordinary transmitter, but listens to a loud-speaker. Side tone is prevented by means of a suppressor. A single-stage transmitter amplifier and a two-stage loud-speaker amplifier with a push-pull output stage are used, making five valves in all, which operate at 200 to 240 V d.c. (100 mA). For a.c. a rectifier and transformer are included. The valves are quick heating, and power is switched on by a relay controlled by the telephone switchboard and the loud-speaker volume control.

With Type B the user may speak at a distance of 2 to 3 ft. from a special microphone, and he listens to a loud-speaker. This set's limitations, due to a tendency to interaction between microphone and loud-speaker, are got over in Type C by the use of switching devices (somewhat similar to echo suppressors), which are operated by the voice currents. A moving-coil microphone and three-stage amplifier are used. Two stages with push-pull output are used for the loud speaker, making six valves in all. No means of side-tone prevention is provided beyond a hybrid transformer and an approximate balance. Singing is prevented by arranging that when the loud-speaker volume is increased, a corresponding loss is introduced into the microphone circuit. In both cases switching off the loud speaker leaves a normal telephone ready for use.

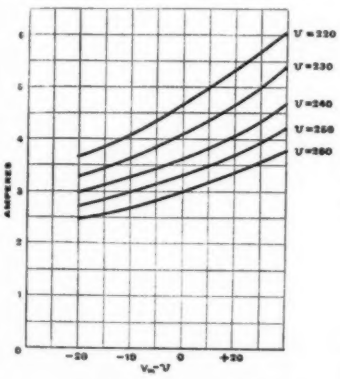
For Type C a subsidiary single-stage push-pull amplifier is provided to operate (*via* metal rectifiers) two gasfilled valves, making eight valves in all. The switching is done by current from the gasfilled valves flowing through metal rectifiers. The change in the resistance of the latter alters the balance of hybrid transformers. Indirectly heated valves operating on a.c. are used, as the gasfilled valves at present available are similar. The set must therefore be switched on a short time before it is required.

Electric Discharge Lamps. By J. W. Ryde

Characteristics of the high-pressure mercury-vapour type

THE new electric discharge lamps were first used in an experimental installation in East Lane, Wembley, in June, 1932; these lamps were made in the G.E.C. Research Laboratories. They have now reached the stage of factory production and are being employed in several street-lighting systems in various parts of the country.

The high-pressure mercury lamp used in these installations consists of two cylindrical bulbs, one within the other; the inner bulb contains rare gases at low pressure and a little mercury, while the space between the two bulbs is evacuated. The discharge takes place in the inner bulb between electrodes (sealed in at each end) consisting of small sticks of alkaline earth oxides, held in spirals of tungsten wire. The spiral wire twisted round the inner bulb is connected to the lower electrode to increase the potential gradient in the neighbourhood of the upper electrode at the moment of starting, thus assisting the initiation of the discharge. As the inner bulb warms up, the mercury is volatilised and the pressure rises. The discharge then contracts and finally takes the form of a narrow column, about 6 in. long.



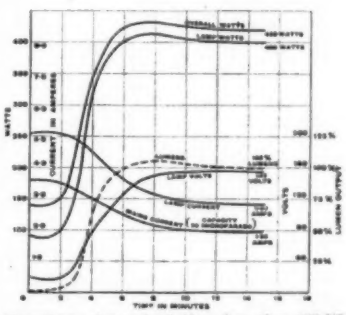
Values of the mains starting currents (condenser capacity 20 μF)

The lamp lights up automatically when switched on. It takes 400 W and has a luminous efficiency of more than twice that of a gasfilled tungsten filament lamp of corresponding wattage. The average life is about 1,500 hours. The spectrum consists of lines in the yellow, green, blue-green and blue, together with fainter ones in the yellow and orange; in addition, a certain amount of continuous spectrum extends from the blue to the orange regions.

Starting Characteristics

The current is carried by ions (negatively charged electrons and positively charged atoms) which are formed by the discharge itself at a rate which increases with the current. Once formed, these ions recombine rapidly to form normal atoms again. The number present, and therefore the resistance of the tube, depends at any given moment on the current passing. Thus the lamp resistance does not remain constant even momentarily when the voltage is changed, and Ohm's Law cannot be applied. A knowledge of the effective resistance of an electric discharge lamp, therefore, tells us very little. The consequent effect is somewhat as though the filament of an ordinary incandescent lamp had no thermal capacity and accordingly changed its temperature, and hence its resistance instantaneously when the voltage was varied. If the lamp is connected to a constant potential supply sufficient to start the discharge, the current which first passes will produce more ions and these in turn will produce a larger current. To prevent the current rising unduly an impedance is connected in the circuit. The curves and figures in this article are representative values for the new "Osira" lamps on a 50-cycle a.c. supply. In ascertaining the overall characteristics, a specially designed G.E.C. choke was employed together with a 20 μF condenser.

As at ordinary outdoor temperatures the mercury is practically all condensed, one or more of the rare gases (*e.g.*, argon) at a pressure of a few millimetres must be included in the bulb in order to start the discharge. The potential necessary to start the discharge is lower in the rare than in the more common gases. In the case of the "Osira" lamp it has been possible to obtain a starting potential so low that all lamps will light with certainty on supplies of 230 V and over. At the moment of switching on, very little light is emitted and the potential across the lamp itself is only about 20 V. The current passing through the lamp is then almost entirely dependent upon the impedance of the choke and is approximately the same as if the lamp were short-circuited.



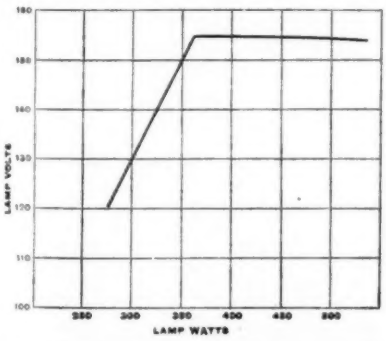
Starting characteristics for the 400-W "Osira" lamp in series with a special choke (supply at 240 V a.c.; 20 μF condenser across supply mains)

As the lamp warms up, the mercury is gradually vaporised and the potential across the lamp increases. At the same time the current falls and the lamp wattage increases, finally taking up the standard running value of 400 W. For a given form of lamp, there is a direct relation between the lumens emitted and the lamp wattage. After about 220 W or 60 V has been reached, this relation is a linear one, so that the lumen output curve is of the same form as that of the lamp wattage.

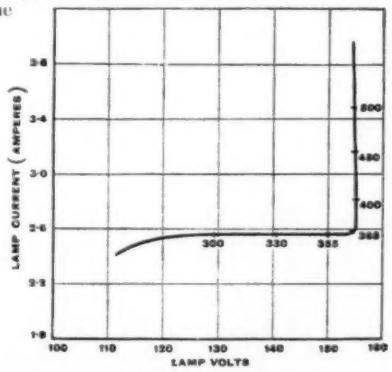
The overall mains wattage curve reproduced, when both choke and condenser are in circuit, is very similar in form to that shown for the lamp wattage. At the moment of starting, the overall value is, however, 141 W and the final value 420 W. The power loss in the choke and condenser is thus only 20 W during steady running conditions, but is somewhat more during the first few minutes after starting.

Steady Characteristics

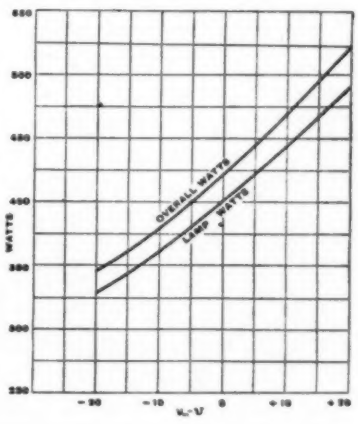
So long as the bulb temperature corresponding to a given lamp wattage is insufficient to vaporise all the mercury, an increase in watts will cause an increase in the lamp volts. When all the mercury has been volatilised, however, the potential across the lamp remains approximately constant. Similarly, so long as there is liquid mercury, the current (after about 300 W) remains almost constant, but as soon as the mercury is all vaporised (which occurs at about 365 W) the current increases with increase of wattage while the lamp voltage remains practically constant. The last two characteristics pertain solely to the lamp itself and are therefore practically independent of the choke.



Relation between watts and potential across an average "Osira" lamp, showing the point at which the potential becomes nearly constant

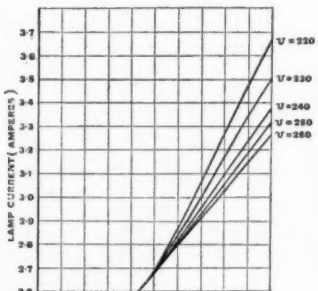


Relation between current and voltage for an average "Osira" lamp (steady characteristics, a.c. 50 cycles). The figures on the curve represent the lamp watts at each point

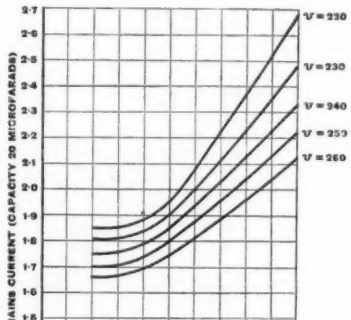


Curves connecting the lamp and overall watts with the difference between supply volts V_m and the v for which the choke is set

As a rough rule, a change of 1 per cent. in supply volts corresponds to a 2.6 per cent. change in watts and a 3.5 per cent. change in lumens. For a corresponding gasfilled tungsten lamp a 1 per cent. change in volts corresponds to a 1.6 per cent. change in watts and a 2.9 per cent. change in lumen output. If the supply voltage increases or decreases, the efficiency of the discharge lamp, like that of the tungsten lamp, will vary, but to a smaller extent.



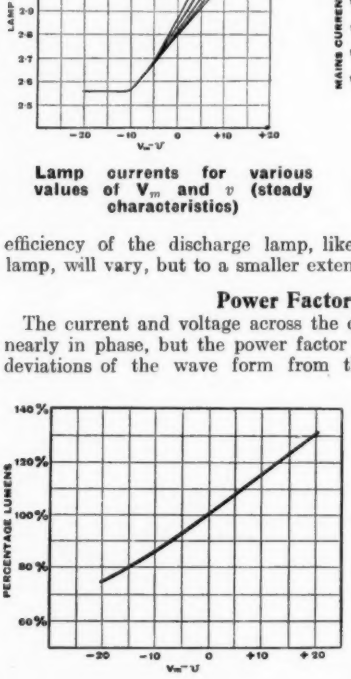
Lamp currents for various values of V_m and v (steady characteristics)



Relation between the mains currents and the difference $V_m - v$ (steady characteristics)

Power Factor

The current and voltage across the discharge lamp are very nearly in phase, but the power factor is about 0.92, owing to deviations of the wave form from the sinusoidal. On the mains side, the choke reduces the power factor to about 0.12 at starting, but it quickly rises to the steady value of 0.62. In "Osira" street-lighting installations, a condenser of 20 μF is placed across the supply and this raises the overall power factor to about 0.90.



Relation between the light output and the difference $V_m - v$

In the curve showing the instantaneous and steady characteristics of an average lamp the latter is formed by the lines AD and DF. The steady lamp wattage, and therefore the steady temperature, is greatest at F and decreases as it passes through D to A. The normal current and lamp voltage correspond to the point E. As soon as it passes below D, the steady lamp temperature is insufficient to keep all the mercury vaporised, so that a certain amount of condensation takes place. Over the portion AD some liquid mercury is always present, and the vapour density decreases steadily from D towards A.

So long as some mercury is present as liquid, any rise in lamp watts (or temperature) will result in further evaporation, with a corresponding increase in vapour density or conversely. With constant vapour density the current lamp-voltage characteristic would be of the form shown by the line FDC. It will be seen that, as in the case of an arc, the potential between the electrodes decreases as the current increases.

At each point of the steady characteristic AD, there will be a corresponding current-voltage curve. These form a family of curves, whose shapes are similar to those drawn at FDC and GAH. Each of these curves, moreover, corresponds to a definite value of the vapour density, and will apply only so long as this density remains constant. This will be the case provided that any change producing an alteration in the current takes place very suddenly. If the change is slow enough the lamp temperature, and therefore the vapour density, will continually adjust itself, and the current and lamp voltage will follow the steady characteristic AD. This forms the connecting link between the whole family of curves for different constant vapour densities. When all the mercury is volatilised, the rate of the current change is immaterial because the vapour density remains constant, and DF forms both the steady and the instantaneous characteristic.

If by altering the air gap of the choke, or by changing the mains voltage, we vary the current through the lamp, which is assumed to be burning normally at 400 W, then, provided that the change does not reduce the lamp wattage below 365, the lamp current and voltage values will follow the line from E up towards F or down towards D. Since no mercury is condensed, it will not matter if the change is fast or slow, but if the change reduces the final steady lamp wattage below 365 (point D), the lamp current and voltage values will follow the line EDA if the change is slow.

Voltage Variations

Assuming that the change is such that the final conditions are represented by the point B, the lamp voltage never rises above 155 V and the current does not fall below 2.56 A. If the change were made suddenly, however, then the current and lamp voltage would follow the instantaneous characteristic EDC, and their values immediately after the change would thus be 1.3 A and 164 V. They will not remain for more than an instant at these values, because some mercury will start to condense and, as the lamp gradually cools to the new temperature, they will follow the curve C to B, corresponding to the case when the change was slow.

The important practical result is that whenever the current is slowly reduced to below the normal burning value, the lamp voltage will remain nearly constant at first and then fall, but if the change is very sudden, it will rise rapidly at first and then fall. In the figure showing the characteristics of the lamp with the choke set for 230 V the steady characteristic is composed of the lines AD and DF; the point E again corresponds to the normal burning conditions and, as before, the portions AD and DF correspond respectively to partial and complete vaporisation of the mercury.

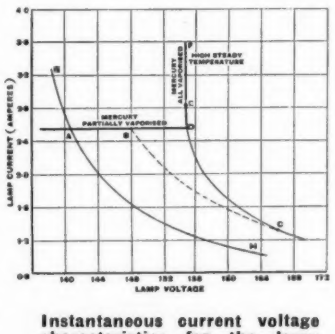
Values for A.C. 50-cycle supplies.

	230 V		240 V	
	Starting.	Steady running.	Starting.	Steady running.
Lamp—				
Amperes	5.6	2.82	5.05	2.82
Volts	19.0	155	19.0	155
Watts	99.0	400	91.0	400
Power factor	0.93	0.92	0.94	0.92
Mains—				
Amperes	4.1	1.99	3.6	1.95
Volts	230	230	240	240
Watts	145	420	141	420
Power factor without condenser	0.11	0.65	0.12	0.62
With 20 μF condenser ...	0.15	0.91	0.16	0.90

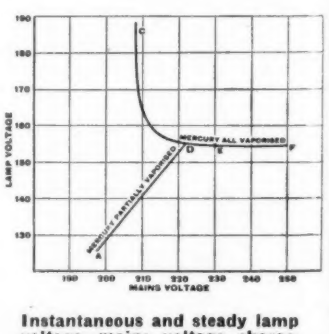
Effects of a Sudden Drop

If the mains volts are reduced slowly the lamp volts remain practically constant until the point D, corresponding to a mains voltage of 222, is reached. After this, any further reduction in the supply voltage results in a fairly rapid drop in the potential across the lamp. This corresponds to the sloping line DA. If the supply voltage were reduced suddenly, the lamp voltage would follow the instantaneous characteristic EDC. This curve soon becomes extremely steep, and if the mains voltage were dropped suddenly from 230 to 207, for example, the potential across the lamp would rise considerably. The potential necessary to maintain the discharge will thus be higher than that available and the lamp will go out.

In practice the mains voltage may be reduced by any reasonable amount, if the rate of fall does not exceed about 15 V per min. Although for a single average lamp, on a supply of 230 V, the allowable sudden drop is about 22 V, in view of supply variations and differences between individual lamps, the allowable sudden drop, for an installation, is not more than about 15 V. If the supply is 240 V nearly 10 V may be added to these figures.



Instantaneous current voltage characteristics for the lamp alone



Instantaneous and steady lamp voltage—mains voltage characteristics. Choke set for 230 V

Steel Progress. By Eric N. Simons

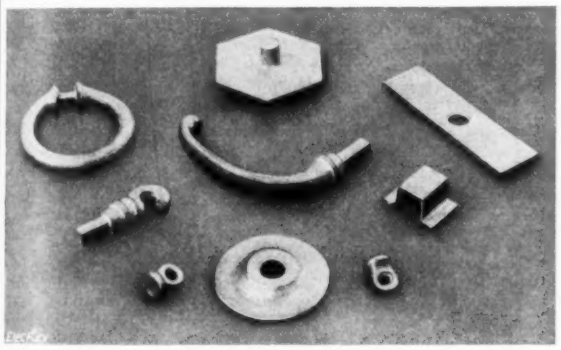
Points of interest for the electrical industry

AN article which appeared in the ELECTRICAL REVIEW of September 2nd, 1932, reviewed modern steel developments as they affected the electrical industry, and since that date there have been still further important advances.

Hitherto, in the manufacture of electrical switchgear, it has usually been found impossible to employ steel castings for some of the smaller parts, owing to the difficulty of obtaining them true to shape and size and free from defects. This difficulty has now been overcome by the use of a new method for the manufacture of very light and intricate steel castings in the Sheffield steel foundry industry. These are so true to form that jigs can be employed in their manufacture during production. The method itself is to some extent a trade secret, but a special method of coring is the principal factor.

Light steel castings for switchgear

Marked advances have been made in the manufacture of stainless steel castings. Until recently the steel castings obtainable—at all events those of small size—were unsatisfactory in the majority of cases owing to roughness of surface, leading to eventual corrosion; distortion of shape; and inaccurate dimensions. These troubles have largely been overcome, and small stainless steel castings can now be obtained with excellent surface, satisfactory shape, and freedom from pitting. Such parts as fittings, handrails, taps, cocks, door-handles, valves, and the like can all be made now in the form of stainless steel castings.



Stainless-steel castings

In permanent magnet steels there have been no immediately new developments, but some sensational claims have been advanced for a new nickel-aluminium magnet steel discovered and patented by a Japanese research worker, Dr. T. Mishima. Tests are being made in this country to establish whether or not the claims made for this steel are justified, and as yet it is premature to express a definite opinion. I would, however, submit that it is not yet time to consider the cobalt steels as out of date, though certainly the new steels, if they are as good as is claimed in the patent, will have a sensational effect on the magnet industry.

Plated Rubber Moulds

The demands of the rubber industry have led to a valuable advance in connection with moulds for the manufacture of rubber articles. This is the chromium plating of steel moulds: In the past it has been the practice to manufacture these of a good quality alloy steel. The new method is of copper plate first, then chromium plate, the moulds, as a result of which they receive the essential hardness and smoothness of surface. With this double plating it is no longer necessary to employ steels of so high a quality. The cost of the two plating operations is less than the total saving on steel, so that the method has the advantage of cheapness. Nevertheless, before this process is universally adopted, certain disadvantages, such as the flaking off of the plating, will need to be completely overcome. Up to now the results obtained have been extremely encouraging.

A new development of great value is the nitriding process, which is a means of obtaining an extremely hard and durable surface on steels not in themselves hard, leaving a core of soft material within. Nitriding is thus, in essentials, a case-hardening process, but the difference is that whereas in the latter carbon is the hardening agent, in nitriding it is nitrogen which penetrates the skin of the steel and ensures hardness; the result is obtained by heating the parts in ammonia gas. As compared with case-hardening, the new process gives a harder surface, and no later heat-treatment of any parts nitrided is necessary, so that they can be put straight into use, whereas with case-hardening heat treatment is essential after the hardening. Thus, finished machined parts can be nitrided without losing shape.

The enormous increase in the use of synthetic materials from which objects and parts are moulded or pressed has caused a correspondingly important advance in steels for press tools, punches, dies, &c., for working these materials. Three principal steels have been evolved for this work, the first being a tungsten-chrome-manganese steel, high in carbon, and containing in addition a small percentage of silicon. The second is a chrome-silicon-manganese steel, with sometimes a little molybdenum added. The third is a cobalt-silicon–molybdenum steel, with high carbon content and a small proportion of manganese. The first of these is a standard steel, oil-hardening, and easy to heat-treat; it is used where low price, or the fact that the materials to be worked or the operations to be performed are not heavy in their demands, is the main consideration. The second steel is more expensive, hardens in air, needs careful heat-treatment, but more than repays its cost in the fact that it will stand up admirably to extra-long runs and very hard service. The third steel is also air-hardening, offers extraordinary resistance to wear, and is extremely hard. It is best adapted for cold pressing.

Fusion-welded Tools

Turning to cutting steels, there have been no sensational changes in base material, the cobalt high-speed steels continuing to reign supreme; but the fusion-welding process has been a revolutionary development. By the employment of a special electric fusion-welding technique, it has become possible to weld small ends of super-high-speed steel on to high-grade steel shanks, forming as a result cutting tools ready for use; these can be sold at a price so low that they can be afforded by even the smallest user. They do all the work of a solid high-speed-steel tool at a much lower cost, and the low price enables the user to scrap them ruthlessly when the end is used up and buy more. Purchase of these tools enables the buyer to get rid of his own forging and hardening plant. They are standardised as to size and shape, shapes

Group of fuse-welded steel tools

being designed by experts, and the heat-treatment given to them is also carried out by specially trained skilled men. Thus, the user runs no risk of wasting valuable steel in heat treatment, and the moment he gets it his tool is ready to go into the machine. The welded part of these tools is a solid *end*, and the tools will fracture anywhere but at the point of union.

A file for bakelite and similar materials is another recent development. Usually the trouble in filing bakelite, vulcanite, &c., is due to the clogging of the teeth of the file, which reduces the tool's effectiveness and makes filing harder and slower. The improved file has teeth cut like the arc of a circle, angle and shape being carefully planned to give the greatest cutting power combined with speedy freeing of the teeth from adherent particles. A good quality high carbon steel is employed, and files up to 14 in. can be obtained.

Altogether the year has been an interesting and progressive one, and there is every reason to believe that the next twelve months will see equally important developments.

Directional Relays. By G. W. Stubbings, B.Sc., A.M.I.E.E.

THE complete protection of transmission networks of moderate complexity can be obtained by the use of overcurrent or impedance relays with directional features. The directional feature is usually given by a separate wattmeter element which controls the action of the principal relay in such a manner that this relay can only operate when the direction of power flow is from the switching station. For three-phase circuits it is customary to use three single-phase directional elements, each of which controls an overcurrent or impedance element.

If all the faults dealt with by the relays imposed symmetrical loading on the system, the directional relays would properly be connected in exactly the same manner as three single-phase meters for energy measurement. But faults on three-phase systems are invariably in the initial stage, single-phase faults, and the normal wattmeter connections, in which current and voltage are in phase at unity power factor, are unsuitable, as in certain fault conditions the relation of current to voltage in one of the relays may correspond to a direction opposite to that of the main power flow in the circuit. Thus, a relay may fail to operate or act when it should be unaffected.

The vector diagram illustrating the conditions which may give rise to this state of affairs is shown in fig. 1, which refers to three single-phase wattmeter relays with their voltage circuits connected in star. Provided that the impedances of these circuits are equal, the potential of the free star point is graphically represented by the centre of the area of the triangle of vectors of line voltages. On the occurrence of a single-phase fault between lines, the voltage between the faulty lines will be reduced to a very low value, as shown in the diagram. The voltages on the three relays can be found by the usual geometrical construction for determining the centre of area of the voltage triangle.

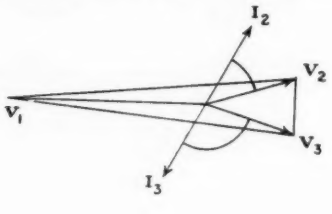


Fig. 1

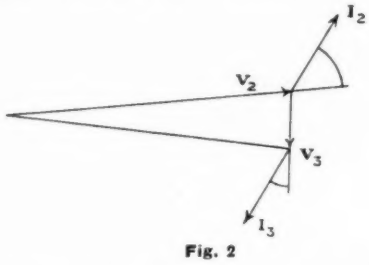


Fig. 2

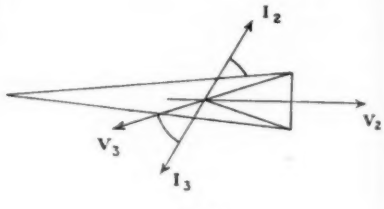


Fig. 3

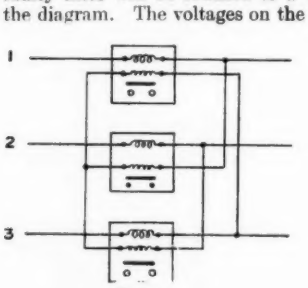


Fig. 4

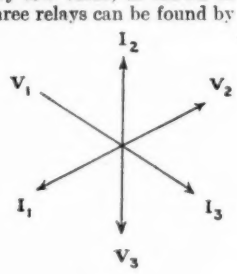


Fig. 5

It will be seen that the phases of the three relay voltages are greatly modified by the disturbance, but that even though the voltage between the faulty lines practically disappears, the values of the relay voltages still remain sensible. In the limit these three voltages have the same phase, and if the fault current lags on the resultant voltage producing it, the phase difference between the current and the voltage in one of the relays affected will exceed 90 deg., and the operation of this relay will be incorrect.

In an alternative method—the "30-deg." connection—the relays are energised by voltages corresponding to the line voltages in such a manner that, with unity power factor and with a balanced load, the current in each relay element leads the voltage by 30 deg. The conditions which arise on the incidence of a single-phase fault are somewhat as shown in fig. 2. Here the effect of the lag of the fault current on the voltage producing it is to tend to bring the current and voltage in one of the relays into phase. The second relay is energised by a current and voltage respectively proportional to those applicable to the fault. Thus, although one of the relays may become almost inoperative due to the extinction of one of the line voltages, the other relay will operate correctly provided that the fault current lags on the voltage producing it by a sensible angle.

A third method of connecting directional relays has been proposed which is sometimes known as the "90-deg." connection. With this method, the current and voltage in each relay are in phase quadrature with a circuit power factor of unity and with a balanced load. The relays are internally compensated so that they are responsive to active watts. The advantage of this connection is that the voltage applied to both of the relays remains comparatively unaffected by the fault, and the lag of the fault current gives rise to conditions in which both of the relays are in a position to operate. The effect of this lag of the fault current can be augmented by an adjustment of the internal-phase compensation of the relays. The disadvantage of the 90-deg. connection is that relays of special design have to be used.

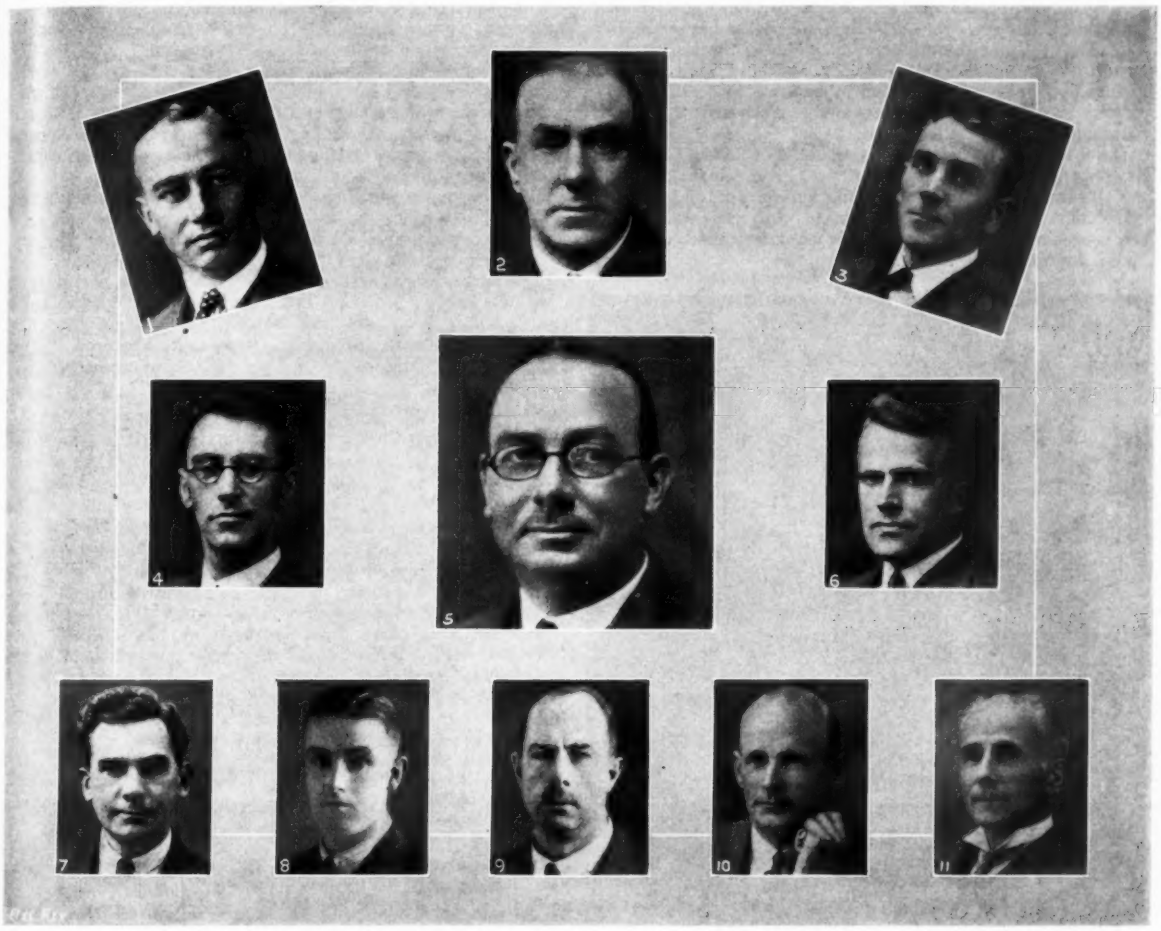
The "Sixty-degree" Method

A further method of connecting directional relays is suggested in the diagram of connections, fig. 4, from which, for simplicity, instrument transformers are omitted. Here the relays are star connected, but the current and voltage in any one relay are not derived from the same phase of the system. The association is so made that, with unity power-factor conditions, the current leads on the voltage by 60 deg., as shown in the vector diagram of fig. 5. The conditions which may arise with a single-phase short-circuit fault are somewhat as shown in fig. 3. From this diagram it will be seen that, as with the connection shown in fig. 1, the voltages on the two relays affected by the fault do not disappear, but remain comparatively unaffected. The effect of the 60-deg. association of current and voltage ensures correct phase relations of these quantities in fault conditions.

The 60-deg. scheme of connections has the advantage of the usual 30-deg. method in that wattmeter relays of normal construction only are required, while it avoids the disadvantage of this system that one of the relays tends to be inoperative in limiting conditions due to virtual extinction of its exciting voltage. The large phase displacement of current and voltage in each relay in normal conditions may render them liable to operation in certain circumstances when the load currents have a leading power factor. Such conditions will certainly correspond to those of light load, when the occasional operation of a directional relay element will be of little importance.

What may be considered a further disadvantage of the 60-deg. connection is the possibility of mistakes in connecting up, and the serious consequence of such a mistake. The voltage on any relay is derived from the phase which leads that from which the current is derived by 120 deg., the virtual lead of the current being obtained by a reversal of the voltage connections. If the voltage is derived from the wrong phase the conditions with a short-circuit will be more likely to give wrong operation than with any other faulty method of connection.

Some Driving Forces in the Industry: L. Weekes (Luton), Ltd.



1. Mr. C. H. Dryden, sales director. 2. Mr. A. Wilkinson, works director. 3. Mr. H. V. Smith, director and secretary. 4. Mr. W. Farbridge, chief designer. 5. Mr. T. H. Dryden, governing director. 6. Mr. P. Capp, A.M.I.E.E., production engineer. 7. Mr. E. A. Waugh, representative for South Wales. 8. Mr. J. Bolt, representative for Lancashire. 9. Mr. F. E. Harvey, representative for the Midlands. 10. Mr. G. H. Mayle, representative for Scotland. 11. Mr. W. S. Wilson, representative for the North-East Coast

A Presentation to Alderman Walker

MEMBERS of the National Joint Industrial Council and the National Joint Board for the Electricity Supply Industry, paid a tribute to their chairman, Alderman William Walker, Lord Mayor of Manchester, on Friday, October 20th, when after a joint meeting of the two bodies, they were his guests at a luncheon held in the Manchester Town Hall.

Alderman Walker has been chairman of the National Joint Board since its establishment in 1920 and chairman of the National Council from its establishment in 1919, to 1930, and from then chairman in alternating succession to Mr. J. Rowan, the trade unions' chairman. In recognition of this long and unstinted service given to the two bodies, his colleagues took the opportunity of presenting Alderman Walker with a letter of appreciation, signed by each member in order of seniority of service and written on parchment and bound, and also with a "Ferranti" radiogram.

Mr. C. D. Taite (Lancs. Electric Power Co.) said that as Alderman Walker was so averse to praise it had been decided that he (Mr. Taite) should adopt the rôle of dictator for the occasion. He then called on Mr. A. de Turckheim to read the letter. After paying a tribute to the services rendered by Alderman Walker to the electricity supply industry, Alderman Huntsman (Nottingham) said that while many great industries in the country bore marks left by violent methods adopted for the determination of disputes, in the electricity supply industry during the existence of the conciliation bodies there never had been a single instance in which an attempt had been made to settle differences by violent action apart from 1926, when larger issues than wages and conditions were involved.

Alderman G. P. Dean (secretary of the employés' side of the N.J.I.C.), supported Alderman Huntsman and referred to the amendments which had been made to Acts of Parliament dealing with workmen's compensation in the electrical industry. These had been passed without opposition from the employers. He was favourably circumstanced to pass on to others in trade union circles information of the work done by the Board. He suggested that the employers should provide paid assistance to Mr. A. H. Banks (secretary of the N.J.B. and labour adviser to the employers' side of the N.J.B. and N.J.I.C.).

In support of the previous speakers, Mr. D. J. Duffy (president of the E.P.E.A.), said that Alderman Walker had gone to a vast amount of trouble in settling differences in the industry. They were engaged in an industry which was producing its product at a lower price than ever before and was producing more. Some people said that this was due to more efficient plant but a great deal of its success could be attributed to the fact that they had a contented body of workers. Behind that was the Whitley Council and Alderman Walker.

Alderman Walker briefly outlined the progress of the Whitley Council, without which supply undertakings would have experienced trouble in making separate terms with the various sections of the employés in each area. That would have resulted in different conditions in adjacent areas. In negotiations every detail of the question under review was investigated by experts, and although they sometimes had difficult cases to deal with, it was very seldom that they had to be referred to an outside person. He was very proud that during all these years they had been able to save the industry from any dispute that prevented the supply of electricity to the public; to the best of his knowledge there were only two undertakings in the country where the whole of the Board's conditions were not being carried out and in each of those cases the difference applied to only one man.

Sir Percival Bower suggested that instead of holding all the Council meetings in London, the venue should be changed occasionally.

A New West-end Restaurant

ON Monday last Messrs. J. Lyons & Co., Ltd., opened their new "Maison Lyons" on the site of the former Marble Arch "Underground" station. This is the last word in modernity, and is naturally lavishly, and electrically, lighted. Electricity is also used in many other directions although the cooking, which would have provided a good load, is done by other means.

The premises are in three parts—the Quebec Café, the Bryanston Café, and the Park Court. The colour scheme of the Quebec Café is pink, and in its illumination about 450 ft. of tubular lamps, four feet in length, are employed. These are concealed behind artistic glass cornices round the walls and at the top of the substantial columns.

The floodlighting installation consists of 120 projectors of various types connected up by rubber-covered cable fixed on the cornices and projections of the building.

The power installation embraces 150 motors. Eighty-one of these are under 1 h.p., and the remainder of over 1 h.p. are on the three-phase supply. The total h.p. is 390. There are sixty-one motors for cooling compressors under thermostatic control. Numerous waffle-making appliances are provided in all services and counters, and in addition to various small electric cooking appliances, toasters, &c., there is an ingenious hot cabinet which can be disconnected and raised above the serving counter in the kitchen to keep it out of the way when it is not required.

A battery of high-speed electric goods lifts has been installed by the Express Lift Co., Ltd., and a number of wine, service and trolley lifts have been supplied by Waygood-Otis, Ltd. There are also a "Magneta" time system and a "Dictograph" telephone service for internal communication.

The Supply System

The main supply is taken from the St. Marylebone undertaking at 6,600 V, and is stepped down to 415 V three-phase, and there is also a secondary supply from the London Power Company. An emergency lighting system ("Safetylyte") is installed. With the exception of the main cables the whole of the installation is carried out with v.i.r. cables in screwed tube. The main cables are paper-insulated, lead-covered and steel-wire armoured, provided at each end with dividing boxes fitted direct on to the switchgear and distribution boards. The main distribution boards in the switchroom are of the new ironclad unit panel type controlled by oil-immersed circuit breakers. The latter are fed off the centre contacts of 2,000-A four-pole change-over switches, one for power and the other for lighting.

The electrical installation work was carried out by Messrs. Lyons's Electrical Engineering Department. The lighting and decorative features were designed by Mr. Oliver P.

The New Maison Lyons, Oxford Street, W.

(1) The Park Court. (2) The Quebec Café. (3) The Bryanston Café

The Bryanston Café is lighted by means of ten specially designed ceiling fittings, and twenty-one recessed wall brackets in harmony with them. These ceiling fittings, made by the General Electric Co., Ltd., are of unusual shape, consisting of two conical pieces in a horizontal plane separated by circular glass discs. Each fitting contains three large tubular lamps and six ordinary lamps.

Ten similar fittings and twenty-three wall brackets are used in the lighting of the Park Court, which is a shopping centre, and in addition there is 340 ft. of "Sunray" tubing surrounding the provision and confectionery counters. This tubing is 45 mm. in diameter, and is filled with a combination of gases which give a warm sunlight effect. It is supported on specially designed chromium-plated hangers fitted below the plaster cornice. The main show windows are lighted by 200-W lamps in trough reflectors with colour screens. The facia is illuminated by 100-W lamps fixed in movable floats to facilitate cleaning. Altogether 1,430 lamps are employed in the building, representing a total load of nearly 100 kW.

There is an abundance of exterior lighting. Above the facia are fitted four groups of lamps of modern design, each group comprising twenty-eight 200-W gasfilled lamps arranged to throw a concentrated light downwards on the shop entrances.

Bernard, F.R.I.B.A., and the lighting fittings and decorative effects were supplied by the General Electric Co., Ltd. Material and equipment were also supplied by the following:—Best & Lloyd, Ltd., Edison Swan Electric Co., Ltd., J. A. Crabtree & Co., Ltd., Dennis & Co., Ltd., Hackbridge Cable Co., Ltd., Julius Sax, Ltd., Linealux, Ltd., Metropolitan-Vickers Electrical Co., Ltd., Maple & Co., Simmonds & Stokes, Whipp & Bourne, Ltd., Wm. McGeoch & Co., Ltd., Walsall Conduits, Ltd., M.K. Electric, Ltd., Igranic Electric Co., Ltd., Wandsworth Electrical Manufacturing Co., Ltd., Magneta Time Co., Ltd., Dictograph Telephones, Ltd., and the Hart Accumulator Co., Ltd.

Midland Electrical Engineers' Ball

The annual Ball will again be held at the Grand Hotel, Birmingham, on November 17th, under the presidency of Mr. S. T. Allen, Central England Engineer to the Central Electricity Board, Birmingham. The chairman of the Committee is Mr. W. H. Heaton, and the hon. secretary is Mr. W. Y. Anderson, 14, Dale End, Birmingham. Early application for tickets should be made to any committee member.

Constant-current Portable Tools. By J. F. Romer

PORTABLE tools working on constant voltage suffer from the disadvantage that, if the motor is highly efficient, there is a considerable difference between the running and standing currents. When a motor driving a drill pulls up dead when breaking through a hole it is liable to burn out immediately, as it is not the practice to use protective apparatus, which would operate too frequently and thus reduce the speed of drilling. As a consequence manufacturers design the motor so that the difference between the running and standing current is sufficiently small to give reasonable reliability, an allowance of 10 to 15 secs. between pulling up and burning out being common, which results in a low efficiency when compared with compressed-air tools. Moreover, motors used on, say, a 250-V circuit are wound with fine wire, which is not ideal for rough usage.

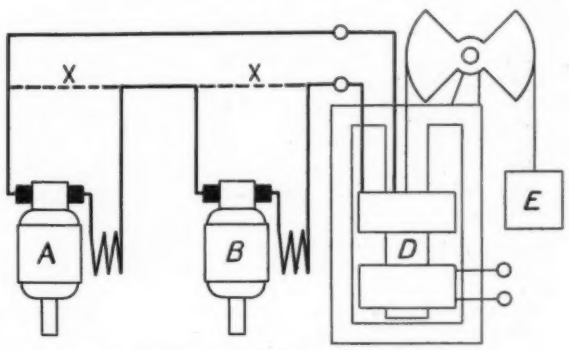
Constant-voltage tools are nearly always driven by series motors, and in order to obtain lightness speeds of the order of 6,000 to 12,000 r.p.m. are used. Because of the great centrifugal force only a small diameter commutator is possible, and when they are required to run on high-voltage a.c. there is difficulty in getting in a sufficient number of bars to give reasonably good commutation. In consequence squirrel-cage motors working on a frequency of about 200 cycles have been tried. Apart from the relatively poor efficiency and starting torque of such motors, the cost of the alternator or frequency changer is a drawback. There is, however, another system, the advantages of which appear hitherto to have escaped the attention of the portable tool makers. It consists of running ordinary series motor tools on current obtained from a constant-current transformer.

In the accompanying diagram the motors A and B are connected in series with the constant-current transformer D; this has a movable secondary supported by bands working over quadrants and counterbalanced by the weight E. The repulsion between primary and secondary coils causes the magnetic leakage to vary and so maintains the secondary current constant. In order to increase the leakage variation it is usual to have a small air gap in the central part of the core. With careful adjustment of the balance weight, current can be maintained constant to within about 1 per cent. To start the motors the short circuits XX are removed.

Any number of motors can be connected in series, but the use of more than two would discount one of the principal advantages of the system—immunity from shock—the motors being intended to run on only 15 V. Should the secondary become accidentally open-circuited with four tools in series a rise in pressure of 300 to 400 V might occur, but with only two in series the rise would not be more than 150 V, which would not require any special protective apparatus.

Because of the low motor voltage only very thin insulation is necessary, giving a high winding space factor and very good cooling, while there is no difficulty in getting in an ample number of commutator segments. As the current is comparatively large, rectangular asbestos insulated conductors of large cross-section can be used giving great mechanical strength.

A 500-W motor with constant voltage would have an efficiency of about 40 per cent. when working on 250 V, and the armature would be wound with wire of about 0.028 in. diameter. On the constant-current system at 15 V, this motor would have an efficiency of about 80 per cent., while the armature would be wound with wire 0.13 in. by 0.056 in., which is, mechanically, very strong, and as there would be no possibility of a burn-out through the motor stalling repairs from this cause would be entirely eliminated. The space factor of the windings being so much greater, the overall dimensions and weight could be considerably reduced, which would compensate in some measure for the increased weight of the trailing cable.



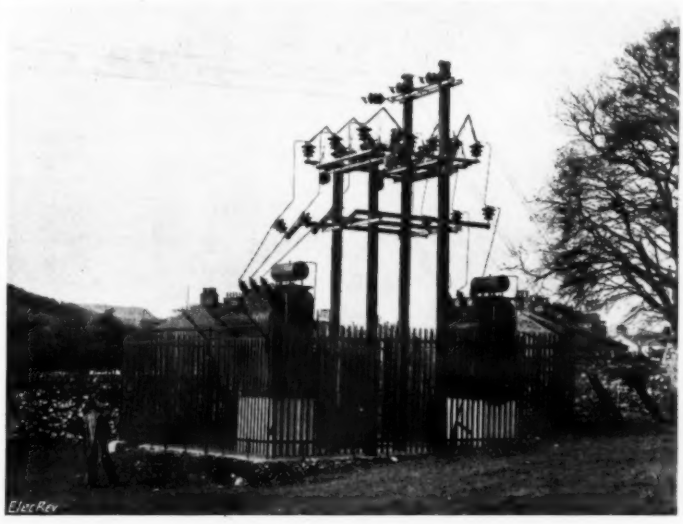
A constant-current supply arrangement

A further advantage is that if a trolley should run over the cable and cause a short circuit, little damage would be done, the transformer acting as an automatic current limiter. As transformers are so much cheaper than motors, the cost per tool would not be increased by more than about 40 per cent., which would soon be saved by the much higher efficiency of the combination. Transformers of the type described have been used to a considerable extent for series lighting and can be made with an efficiency of about 96 per cent. The advantages of the constant-current system for portable tools, namely, "fool-proofness," no danger from shock, and high efficiency, are so great as to make the system well worth a trial.

Flexibly Constructed Overhead-line Switches

STANDARD SWITCHGEAR, LTD., has at present under construction equipment for several complete sub-stations and kiosks, and the 33-kV switchgear for the Isle of Man electrification scheme (see our issue of August 11th, page 187). These switches have substantially lined plummer block bearings fixed on heavily galvanised frameworks, and small parts are triple cadmium plated. The current-carrying sections are heavily nickel-plated and have large wiping surfaces; the movement can be operated by one hand, and shock springs remove entirely mechanical strain from the insulators.

These insulators are designed to withstand wet and dry flash-over pressures of 135 kV and 175 kV, respectively, and a bending mechanical stress of 500 lb. On test they withstood a load of 1,000 lb. for one minute without damage, permanent distortion or loosening of the fittings. The current, potential and mechanical tests were conducted with the switches erected on poles in the grounds adjoining the works.



Standard Switchgear 33-kV switches at a sub-station in Yorkshire

Modern measures are adopted to prevent corona and brushing, and attaching the contact-carrying parts mechanically to the insulator provides a flexibility of movement for contraction and expansion without imposing any strain on the insulator proper. This method of construction is calculated to eliminate fractures resulting from lightning phenomena, a subject in which extensive research has been conducted.

The company has secured recently the contract for the complete equipment for four static sub-stations for the Dover electricity undertaking, including transformers, 6,600-V truck-type switchgear, and 2,000-V, two-phase, three-wire pedestal equipment for controlling outgoing feeders.

MEETINGS AND DISCUSSIONS

Current Topics and Opinions Expressed at the Institutions

Power Station Auxiliaries

THE object of the long paper by Mr. J. W. A. Abernethy which was read before the London local technical group of the ELECTRICAL POWER ENGINEERS' ASSOCIATION on October 24th was to draw attention to certain very important features of the motors and their control gear used to drive power station auxiliaries which are not encountered in ordinary industrial service. No fixed rules as yet govern the type of electrical drive for auxiliaries, and hence each case must be considered on its own merits. The power station designer finds it no light task to discriminate between the numerous alternatives brought to his notice by progressive makers of motors and control gear, and an attempt has therefore been made to set out the conditions affecting the choice of suitable equipment, also the characteristics of the various methods by which the auxiliaries may be driven.

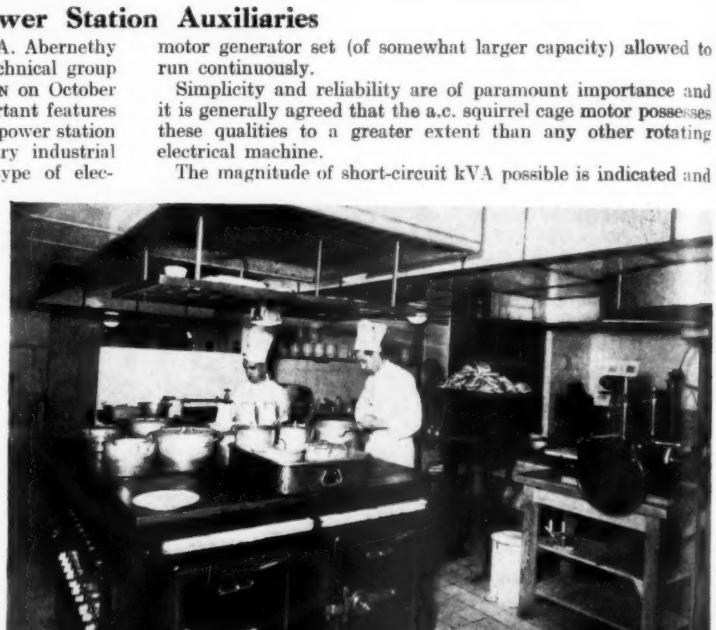
Suitable Supply Voltages

Except for certain duties for which d.c. would seem to be the more suitable, the supply to all motors up to about 100 h.p. should preferably be the standard of 400 V, 3-phase, 50 cycles. Above 100 h.p., it will generally be found more economical to install 3,330-V motors and switchgear. It is not advisable to build 3,300-V motors for an output of less than about 50 h.p. at 1,000 r.p.m., but here again no hard and fast rule can be given. This voltage is definitely considered high by the motor and control gear makers, but in some cases a cheaper compromise would be 650 V which is the generally accepted limit for low-voltage apparatus.

Many power stations are equipped with a storage battery of considerable size for energising the operating coils of the main switches, &c. In such cases d.c. could be used for motors up to, say, 5 h.p., particularly where speed variation is required; *e.g.*, the stokers and/or mill feeders. To supply these drives will probably necessitate installing larger plant than would otherwise be required, but the battery need not be any larger if arrangements be made to "float" it across the d.c. mains and the motor generator set (of somewhat larger capacity) allowed to run continuously.

Simplicity and reliability are of paramount importance and it is generally agreed that the a.c. squirrel cage motor possesses these qualities to a greater extent than any other rotating electrical machine.

The magnitude of short-circuit kVA possible is indicated and the author advocates the omission of overcurrent releases from control gear. Fault protection by high rupturing capacity fuses is recommended. The advantages of contactor control gear are emphasised, the chief being that for boiler-house equipment the push-button can be mounted alongside the boiler instruments and gauges, and in convenient centralised positions for other services.



The kitchen at Broadcasting House, London, W., in which electricity is extensively employed. The large range in the foreground bears the name of the Falkirk Iron Co., Ltd.

The Future Control of Distribution

THE national grid, the problem of distribution, and the development of sales formed the subject of Mr. G. G. L. Preece's inaugural address as chairman of the North-Western Centre of the INSTITUTION OF ELECTRICAL ENGINEERS on October 24th at Manchester.

The grid, he said, was based on estimates of consumption that proved to be unduly optimistic, but who could have foreseen the great trade depression? The Central Electricity Board was undoubtedly anxious and recognised that great efforts must be made to ensure the grid being a financial as well as a technical success. Hence the reorganisation of E.D.A. and the proposed reorganisation of distribution. The one guiding principle should be trusteeship, and the time was not far distant when the running of electricity undertakings for any other purpose than the benefit of the consumers would not be tolerated. National public control would come eventually, if not immediately.

What qualifications should be required from an undertaking before it was permitted to retain its powers and rights and to pursue its work without interference by an external body? For answer Mr. Preece quoted the views expressed by "Candidus" in the ELECTRICAL REVIEW of June 30th, 1933 (page 947), in an article entitled "The Reorganisation of E.D.A.—And After."

Many of the smaller undertakings had shown greater enterprise and had relatively much better results than some of their larger brethren, in spite of their limited resources. How much better work would the engineers of such undertakings do if they were given adequate resources? That such engineers had done so well was largely due to the personal touch they had with consumers in their areas. This was an extremely important point, and in any scheme of reorganisation into bigger areas the utmost regard must be paid to the necessity of retaining, and even extending, that personal touch.

The personnel necessary for greater efficiency on the distribution side of the industry might cause anxiety. It needed to be extended and made more attractive by more adequate remuneration. If the personnel now inside the supply industry was insufficient in numbers, as it might well be, then recourse must be had to other branches of the electrical industry where there would be found an ample supply of engineer-salesmen.

Mr. Preece next examined existing potentialities for increasing consumption, including the substitution in industry of electrical for mechanical power, the replacement of private plant by public supplies, railway electrification, road traction, pumping for water supplies, water heating, and domestic electrification.

Load Building for the Grid

IN his inaugural address as chairman of the Mersey and North Wales (Liverpool) Centre of the INSTITUTION OF ELECTRICAL ENGINEERS on October 23rd, at Liverpool, Mr. W. Welbourn expressed his belief that the output of the grid would reach 21,000 million kWh by 1941. Electrical engineers, he said, ought to have sufficient confidence in their business ability to make sure of a consumption of at least 500 kWh per head per annum in this country by 1940.

Thirty-one foolscap pages are filled with data and statistics to serve as a basis from which the possibilities of load building in certain industries may be gauged. For instance, British coal mines are potentially a much greater field from an electric power supply point of view than any other industry, for about 1,900,000 h.p. of steam engines still remains to be converted. The next industries in importance are iron and steel and textiles with something like 1.5 and one million h.p., respectively, of steam engines still in use, representing another tremendous potential load for the electricity supply industry.

Again of 470,000 farms in this country, supplies of electricity are given to fewer than 4,000. The domestic load is considered to be the most stable of all and the one with the largest possibilities of expansion in the immediate future. In the areas which the grid will serve there are to-day 12 million homes, of which 4,100,000 only are wired. Some 600,000 houses were

wired during the past year, so that if the present rate is maintained there should be 8,300,000 connected in 1940. There are still ten million gas consumers in this country.

Mr. H. W. Grimmitt, of the Electricity Commission, has stated that with suitable tariffs it is safe to anticipate a domestic consumption of at least 1,000 to 1,500 kWh per consumer. Mr. Welbourn does not think it too optimistic to budget for nine million domestic and shop consumers (a large number of homes and shops being combined in one building). On the basis of 75 per cent. of Mr. Grimmitt's lower figure, the total domestic load would be 6,050 million kWh per annum. Assuming the present domestic load to be of the order of 3,000 million kWh per annum, the probable increase by 1940 would therefore be over 3,000 million kWh.

The Sales in 1940

From the figures quoted Mr. Welbourn forecasts that the sales by the Central Electricity Board through authorised undertakers in 1940 will be as follows:—

	kWh sold per annum millions
Output of authorised undertakings in 1933 ...	11,000
Domestic, additional load	3,000
Industrial, additional load	2,500
Metalliferous mines, additional load	1,880
Coal mines, additional load	1,000
Railway electrification, additional load ...	500
Electro-chemical and metallurgical, additional load	400
Street lighting, additional load...	250
Non-metalliferous mines and quarries, additional load	100
Farming, additional load	70

The anticipated total by 1940 is thus 20,700 million kWh per annum, representing a rate of increase for the seven years of nearly 1,400 million kWh per annum.

Voltage standardisation is an essential requirement, particularly for domestic load development. Courageous planning of distribution systems is needed and should precede the sales drive. In Canada the latest method is as follows: when an all-electric home cannot be established, a consumer is persuaded to have a complete all-electric kitchen or laundry, not merely a single cooker or iron. But in the United States concentration is still on a single item at a time, *i.e.*, this year it is the sale of refrigerators for domestic use.

From his examination of the load waiting to be developed Mr. Welbourn reasons that a properly organised sales drive would double the output of the grid in eight years. The grid scheme is a national one and national honour is concerned. It must not be allowed to fail. Every one in the industry is vitally concerned and self interest should spur on all to help, so that it "shall not become a burden on the taxpayer."

* * *

Overhead Distribution

At the monthly meeting of the OVERHEAD LINES ASSOCIATION in London on October 18th, Mr. A. Lennox Stanton, the retiring president, pointed out that the overhead distribution line was but a link in the scheme of things, the main objective being the delivery of electricity to regions at present indifferently served or not at all. The needs of the future might demand a widening of the scope and a deepening of endeavour if the full measure of the original objective was to be attained.

Mr. T. Rich, in his presidential address, urged the prime importance of service. All social services should co-operate for the mutual benefit, and for that of the public. As a contrast to a case in the West of England, where it had cost more to arrange wall attachments to support an overhead low-voltage line along the centre of an alley than it would have cost to pull up the pavement and put the line underground, he mentioned that in the North of France the people had wanted the convenience of electrical service, and realised that the best way to get it, at the lowest cost and with the least delay, was to help and not to obstruct. For the last fifteen years continuous progress had been made in rural electrification; considering what it had had to face, it was remarkable that it had gone ahead so quickly. In very few countries in the world could it be said that electricity had been a material factor in agriculture. Rural electricity was no gold mine to those promoting it; it required enterprise, energy, and financial patience.

The Grid in Scotland

Electricity production in South Scotland was dealt with by Mr. Norman C. Bridge in his inaugural address as chairman of the Scottish Centre of the INSTITUTION OF ELECTRICAL ENGINEERS at Glasgow on October 17th.

He said that the Central Scotland portion of the national grid was the earliest, along with the Mid-East England section, to be completed and put to work on the statutory trading basis. The declared grid tariff had been operating there since the beginning of this year and the remarkable operation of changing the frequency to 50 cycles had been successfully accomplished in the districts around the Clyde. Although the country had great iron and steel works, the utilisation of surplus furnace heat for generating electricity had not been developed on any large scale.

Five new water-power stations, with a combined output of 102,000 kW, which comprised the Galloway scheme, would have a considerable influence on plant development in Central Scotland and their dependence on water-power would grow. Diversity of use among domestic and non-industrial consumers had become a beneficial factor with regard to standing charges, but the foremost contribution to increased consumption must be sought in further supplies for industry. New outlets for power on a large scale did not seem to be imminent, though the electrification of the Glasgow subway might be the forerunner of further railway developments. Rural electrification must be relatively slow, but there was ample scope for this in the Lowland districts.

Mining Electrical Engineers

The West of Scotland Branch of the ASSOCIATION OF MINING ELECTRICAL ENGINEERS visited the Carron Works, Falkirk, on October 14th. The guests numbered about 150, and were welcomed on behalf of Carron Company by Mr. James R. Laird, president of the branch. Mr. David Martin, past-president of the Association, expressed the thanks of the visitors for the hospitality extended them by the company.

Later, in his presidential address, Mr. James R. Laird dealt with the question of facilities for students and apprentices. He understood from the Association that, particularly in Scotland, very few students presented themselves to sit for the examinations of the Association. In his opinion, the first thing to be done was to form a syllabus which would give the student the necessary knowledge to obtain the certificate in five years. This should be done in conjunction with educational authorities and the technical colleges. Then areas might be grouped and an assurance given that a sufficient number of students would go forward to justify a class.

Cinema Current Costs

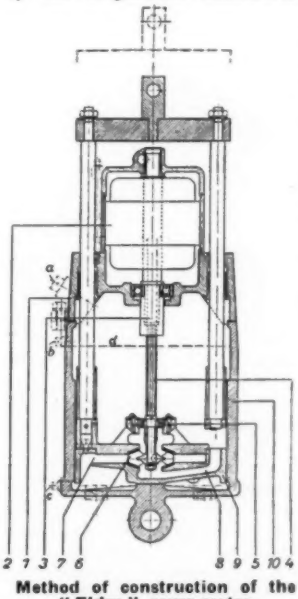
Mr. C. Hartley-Davies, technical advisor to the Manchester branch of CINEMATOGRAPH EXHIBITORS' ASSOCIATION, addressing a meeting of members at Rochdale on Friday, said that he had for years contended that if exhibitors as bulk users of electrical energy bought from local undertakings at anything above 1d. per kWh they were buying uneconomically. The vast majority of picture houses could produce all the current they needed at ¾d. per kWh. Six months ago, the proprietors of an Ipswich cinema had to pay £1,060 a year for current with a m.d. of 60 kW. They decided to install oil-engine plant of 68 kW on split load, with a safety action against breakdown load of 34 kW. The power consumption bill was now about £300, and the picture house would pay for the complete plant with the savings effected in the first thirty months. After that they would have an asset of £1,600 on their balance-sheet, and an added annual profit of about £650.

Sub-station Switchgear

The second lecture under the National Technical Group Scheme of the ELECTRICAL POWER ENGINEERS' ASSOCIATION was delivered on October 20th at the Northampton College of Technology, on "Sub-station Switchgear," by Mr. J. R. Mortlock, and was illustrated with an interesting series of lantern slides. Mr. O. F. Bailey, lecturer in electrical engineering at the college, presided in the absence of Mr. J. Blakeman, principal.

An Electro-Hydraulic Servo Motor

THE accompanying illustration shows the construction of the "Eldro" servo-motor which has been produced by the Allgemeine Elektricitäts Gesellschaft (Berlin) for such applications as the operation of machines hitherto actuated by foot or hand levers, the operation of brakes, clamping devices, etc.; or the operation of light presses in sheet metal, carton and ceramic industries. A high-speed motor 2, carried by the cover 1 of a cylinder 10, drives a centrifugal pump 6 mounted in the piston 9. The motor shaft 3 is coupled directly to the pump spindle 4, which is carried by a ball-bearing at 5. A filling plug *a* and overflow *b* enable the cylinder to be filled with oil to the level *d*; and the drain plug *c* is used when the oil needs replacement. Normally, the piston rests at the bottom of the cylinder as shown. When the motor is started, oil is drawn from above the piston by the pump (directly on the upper side and also through the passage 8), and expelled *via* 7 beneath the2piston, which is thus raised. Steel rods, mounted in the piston and connected by an external cross-head, transfer the motion of the piston to the device operated.



Method of construction of the "Eldro" servo-motor

Correspondence

Correspondents should forward their communications as early as possible. No letter can be published unless we have the writer's name and address in our possession

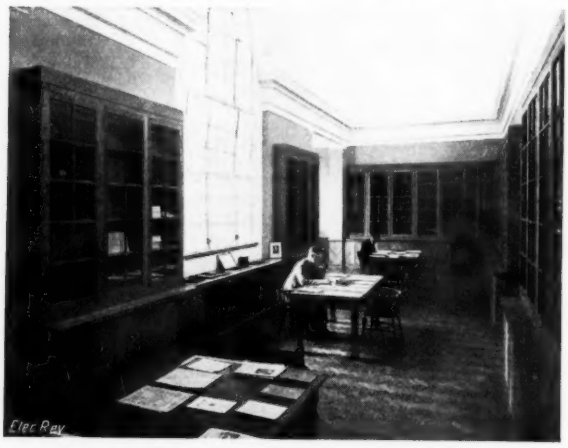
Domestic Electricity Consumption

I am able to supply some interesting data on the consumption of electricity in a modern six-roomed type of house. The electrical appliances in use and their loadings (in kW) are as follows: General lighting, 1.0; garden floodlighting, 1.0; cooker, 5.9; 10-gallon water heater, 1.0; kettle, 3 pint, 0.9; three fires, 4.75; toaster, 0.6; iron, 0.45; radiogram, 0.1; car heater, 0.06; clock, 0.01; vacuum cleaner, 0.18; total 15.95 kW.

The consumption during the last three years is shown in the following table:—

Quarters.	Lighting. kWh.	Heating and Misc. Appliances. kWh.	Cooking. kWh.	Water Heating. kWh.	Total. kWh.
Sept., 1930—June, 1931 ...	227	803	1,288	2,584	4,902
Sept., 1931—June, 1932 ...	249	1,300	1,205	2,477	5,231
Sept., 1932—June, 1933 ...	256	1,056	1,374	2,502	5,188

Energy is charged for at ¼d. per kWh in summer and ⅜d. per kWh in winter, with a fixed charge of £4 12s. 6d. There are three in family, and the only other form of fuel used is



The library at the G.P.O. Research Station, Dollis Hill

one coal fire during the winter evenings. One interesting thing to be noted is that water heating accounts for nearly 50 per cent. of the total consumption, and therefore is a first-class load for the supply authorities, particularly on account of its high load factor. Each circuit, with the exception of water heating, is on a separate phase and each has its own meter. Fortunately there is no meter rent! R. J. BISHOP.

Oxhey, Herts, *October 20th.*

The Co-ordination of Distribution

I have not yet had an opportunity of perusing Mr. J. M. Kennedy's presidential address to the Association of Supervising Electrical Engineers, but the references to it in your journal and elsewhere make very interesting reading. Mr. Kennedy is probably as well informed as anyone in the industry as to the trend of events, and therefore no doubt writes with a certain amount of inside, if not inspired, information. For this reason I am particularly interested in what he has to say in respect of the future of distribution in this country.

It is with some considerable personal gratification that I observe he is now coming out as it were into the open, and indicating a possible definite line of advancement. He suggests that present distribution conditions cannot remain much longer; that they must either advance by voluntary effort, or give place to some new authority which will take over the powers. He sees that there are almost insuperable difficulties in the way of voluntary schemes of co-ordination, and frankly admits to the conclusion that some form of Government intervention seems inevitable.

He appears to take the view that the rumoured proposals for some sort of experimental scheme which he believes to be under consideration are more in the nature of a political expedient than an attempt at a practical solution of the problem, and doubts whether it will ensure the desired result. He foresees not only the possibility of violent opposition to such a scheme, particularly by the smaller authorised undertakers who are to be absorbed, but also the inability of the larger authorities to operate such a scheme without allowing their individual vested interests to prejudice them unduly to the detriment of the scheme. It would appear that it is these underlying thoughts which have prompted him, as I say, to come out into the open and clearly indicate what he believes to be the most probable satisfactory solution of the problem.

I entirely agree with him, and consider that he has done a service to the industry by speaking so openly and placing the position so clearly before us. To me it is at least a satisfaction to find so eminent an engineer as Mr. Kennedy now definitely and confidently voicing the opinions expressed by me on many previous occasions, more particularly in my presidential address to the Incorporated Municipal Electrical Association in 1929 and in my paper on "The Future Development of Electricity Distribution in Great Britain" submitted to the same Association at its annual convention in 1931. Anyone who will take the trouble to refresh his memory by again reading those two contributions will find therein stated not only the underlying difficulties as suggested by Mr. Kennedy, but also the solution which he now enunciates.

In the inaugural address which as chairman of the Western Centre of the Institution of Electrical Engineers I delivered last week on "The Electricity Supply Industry and the Need for Co-ordination in Economic Policy," I stressed all these things again, but approached the problem from a somewhat different angle, and in conclusion submitted additional reasoned considerations in support of my contention that if the industry is to be given a fair opportunity for a really big development, fulfil its true function as a public utility service, and take its full share of responsibility in a return to lasting national prosperity, it cannot continue with impunity under present conditions, but that those responsible for the industry must conceive a broad statesmanlike scheme of co-ordination on a national basis. Mr. Kennedy's excellent address is a great encouragement to such an economic policy.

A. NICHOLS MOORE,
Borough Electrical and Tramways Engineer.

Newport, Mon., *October 23rd.*

A Commercial Electrical Association

There are many members of the electrical industry who feel that an association of those engaged in the commercial side is essential if the coming campaign is to be carried on successfully and efficiently. It is difficult to appreciate the logic of the argument that because there is already a multiplicity of associations there is no necessity for one which would cater purely for commercial men. At a recent dinner of the E.P.E.A. one of the speakers remarked that if that association was not sufficient then "God help the industry!" This may be good rhetoric, but like most modern rhetoric it is merely "full of sound and fury signifying nothing."

After all, to quote the old adage, it is only the wearer who knows where the shoe pinches, and it is commercial men themselves who should decide whether such an association is desirable or not. The main objects would be to assist in the efficient development of salesmanship covering all branches of the industry, manufacturing, supply and distribution, and the elimination of all obstacles tending to hinder their free development.

It is understood, of course, that only representatives of British manufacturers and undertakings would be eligible for membership and I suggest that it should be named the British Commercial Electrical Association. I should be very pleased to hear from anyone interested in the establishment of such an association, so that little time would be lost in the preparatory stages.

M. W. SINGER,
M.Sc.Tech., A.M.I.E.E.

Birmingham, *October 21st.*

Better Salesmanship Needed

After reading the correspondence in your columns on this subject from "Stud. I.C.E.," Cuthbert H. C. Stanley, and others, I wonder to what end, if any, it will lead. I suggest that it is quite futile to blame the contractors, salesmen, or any one branch of the industry, and that little, if anything, will be gained until the industry is nationalised.

The whole of the grid scheme, costing many millions, has to be made to function to pass on to industry the obvious advantages of cheaper energy, enabling manufacturers to compete with foreign firms in the matter of cheaper production, instead of the present suicidal method of depleting staffs, decreasing wages, &c., to reduce costs. The plums have been picked, the ratepayers have to foot the bill in connection with the grid scheme, and we have no means of obtaining current for industrial purposes as cheaply as it is obtained in America, Denmark and Sweden. Is it not time that we imported cheap current in bulk, instead of continuing to utilise coal?

Unfortunately, privately owned supply companies are able to sell energy at a figure sufficient to maintain a good yearly dividend, and providing that any Tom, Dick or Harry is able to persuade a householder to permit him to run a few lengths of wire into his house, and also providing that an installation (so termed) is satisfactory so far as a resistance test is con-

cerned, the supply company will very willingly connect the installation to its mains.

If, however, the mains happen to be unable to bear the additional load imposed, then no cooking, water heating, or other potential load will be catered for until the profits of the company begin to dwindle and it has to seek other fields to produce dividends to keep the shareholders quiet.

It is not a question of public demand but of vicious private trading that is the trouble with the electrical industry to-day. What is the Government going to do about this ill-advised and now out-of-date national grid scheme?

Hebburn, Durham, *October 10th.* H. F. SECRETAN.

Electricity in Wooburn and Bourne End

With reference to your mention in your Electricity Supply news of October 20th of the above villages being about to receive a supply I think perhaps you might be interested to hear that it is in connection with street lighting that the Parish Council and this company have arrived at an agreement.

The first few lamps were lighted on Saturday last. The balance, making eighty-six in all, will, I hope, be completed within three weeks.

P. C. ORCHARD, *Engineer and Manager,*
Cookham & District Electricity Corporation, Ltd.
Marlow, *October 23rd.*

Current Transformers

Whether one phase of the transformer be short-circuited directly—as now proposed by Mr. Stubbings—or, as the result of an earth fault on one of the secondary lines, does not invalidate the argument, from which, moreover, it is incorrect to conclude that *no* current can flow. A current *can* flow, but it cannot, for reasons already stated, contain a *zero sequence component*—which is the essence of the original argument.

Finchley, N.3, *October 24th.* THOMAS ELLIS.

Measuring Small A.C. Voltages

The method described and illustrated by Mr. Banner in your issue of October 6th appears to be still-born for two reasons. These are: (1) The absence of a phase-shifting device would prevent balance ever being obtained except in the unusual case of the "test" and "standard" voltages happening to be exactly in phase; (2) the characteristic of a rectifier (copper-oxide presumed) is such that it requires between 0.4 and 0.5 V initially before it commences to pass current—*i.e.*, its impedance rises enormously below 0.4 V and only becomes of fixed value above this voltage. In other words the expression for the voltage across a circuit containing a rectifier is very approximately $V=0.4+IR$, where R is the circuit resistance.

Now, since the object of the method is to measure small voltages it is clear that this initial 0.4 V (approx.) is sufficient to preclude the use of a copper oxide rectifier as a detector.

The problem of measuring small a.c. volt drops without vitiating the circuit conditions has interested many instrument engineers. I solved it to my satisfaction three years ago by taking a unipivot galvanometer, full scale 100 μA, and stacking into its case a minute "Mumetal" transformer and Westinghouse rectifier. Two instruments were designed, one full scale for 60 mV and another full scale for 30 mV, with an impedance of over 3,000 ohms per volt! Both models were robust and fit for shop use. These avoided all necessity for a potentiometer, auxiliary source of supply and the other associations; further, they were as easily portable as a cell-testing voltmeter. The principle was, of course, step-up transformation and negligible loading of the output winding.

New Barnet, *October 21st.* F. L. BEST.

In reply to Mr. Felton's comments in your issue of October 20th upon my article I may say that the method described is an artifice that is of use in circumstances where no other method is applicable. Direct-reading voltmeters of the order of 1 V a.c. are not practicable for reasons given. It is not therefore a case of comparing the accuracy of the artifice with an existing instrument, the a.c. potentiometer excepted.

The method has certainly been used on meter series coils as no other direct-reading method was available in the circumstances. Results of sufficient value were obtained to justify the method, although it is admitted that other uses were in mind but were not given in full, as once the method is understood the applications follow. Some of these other uses to which the scheme has been applied are to measure the volt drop across switch contacts and fuses. The method is not applicable to a pure inductance where the phase angle is 90 deg., as will be realised from the study of the scheme.

(The "milliammeter" referred to by Mr. Felton should be "microammeter," as in the text. The diagram is in error—*vide* my letter of October 16th.) E. H. W. BANNER.

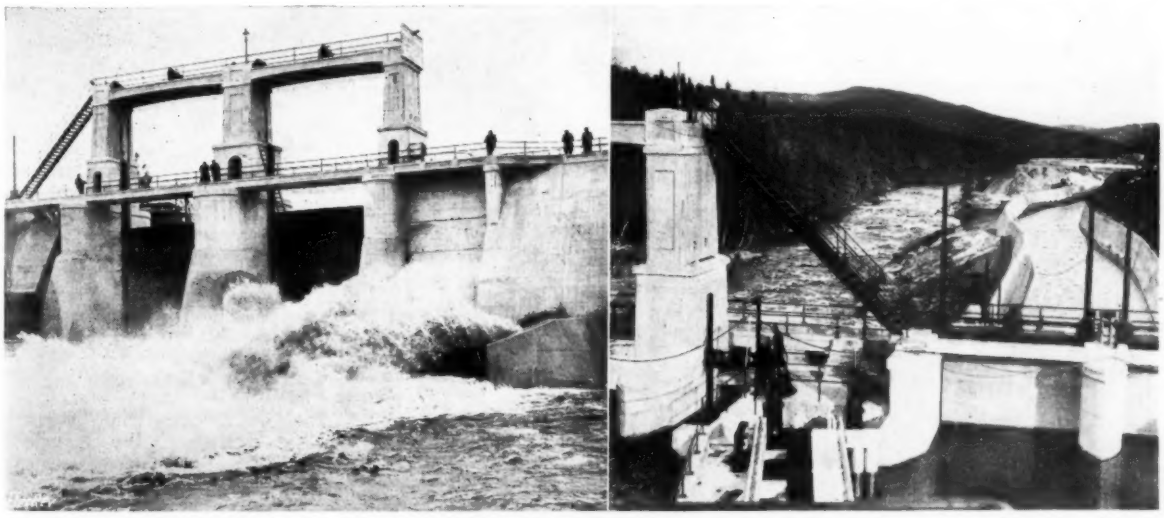
Manchester, *October 23rd.*

A Central Showroom for London

Having regard to the fact that a grid tariff will be in operation in the near future for the South-East England Scheme, I would call attention to what appears to be an important means of ensuring its successful operation. Considering that the success of the scheme will be reflected in the full results of the Board's operations, it is highly important for the electricity supply industry to employ every means within its power to enable satisfactory results to be possible. The success of the Board is closely associated with the success of individual undertakings.

London is a great potential market for electrical apparatus; it is a centre where national publicity can be employed effectively; and a quarter of the national requirements is generated in London. There is therefore every reason for the establishment of a central showroom and demonstration premises, which would not only be worthy of London but of the great industry it would represent. If this were placed in a prominent thoroughfare and judicious advertising methods were employed, national attention would be drawn to the advantages of electricity in an unostentatious but convincing manner. Such premises would be complementary to, rather than competitive with, the existing organisations of similar nature.

Representative examples of every kind of electrical equipment would be exhibited, including lamps, lighting fittings, cooking and heating apparatus, wireless, clocks, small domestic power applications, &c. Demonstrations and lectures would be given in the principal domestic uses of electricity, *e.g.*, cooking, washing, heating, the selection of type of lighting



Two views of the Grampian hydro-electric power scheme which is now nearing completion. On the left is the Dunalastair intake dam and two of the syphons discharging 1,700 cu. ft. of water per second. The right-hand picture shows the aqueduct carrying the water from Loch Rannoch to the Tummel Bridge plant

fittings according to illumination characteristics, and popular lectures dealing with the economic and other advantages of electricity, and comparisons with other available agents. An information bureau would supply any desired information on matters connected with electricity supply in the London area.

Records of all inquiries would be kept and analysed, and the resulting information distributed to all undertakings. Prospective consumers or purchasers would be put into touch with the appropriate undertaking or firm. Orders would be booked, but where a sale was not effected immediately or a new connection made a "follow up" service would keep in regular contact with inquirers. The primary function of the organisation would be educational and an industrial service could be initiated later. A live management supported by a well-paid, interested, enthusiastic and capable staff drawn from the best of the industry would be a first essential.

Working in liaison with the E.D.A. and the undertakers' and manufacturers' showrooms, pooling all experience to the common good, and pursuing a bold policy, advantage to all would ensue. As regards finance, each undertaking would be requested to subscribe according to the number of units sold or some other agreed standard with a contribution from E.D.A. and interested manufacturers. Any sum spent upon such a scheme would be amply repaid, and I am willing to support my contention by making a substantial initial contribution interest free for two years. S. B. Jackson.

London, W.3, *October 17th.*

Warming Buildings by Electricity

I am reluctant to pursue in your Correspondence columns a discussion regarding the respective merits of warming buildings by electricity or fuel oil, but since Mr. Copeland enjoins not only myself but the whole industry (through the E.D.A.) to exercise "a little caution when offering advice to electricity salesmen" I should like to tell him that if circulating pipes and multi-column radiators were the only means available for warming buildings there might be some point in his advice.

We are not concerned with his purely gratuitous suggestion that we are confusing prehistoric blow-lamps with modern automatic oil burners. The fact is that electrical warming apparatus can be secured which operates at 100 per cent. efficiency and can be installed with such a degree of flexibility that wastage of B.th.u.s is entirely avoided. The electricity consumption in kWh is accordingly much below the figures invariably put forward by our opponents when submitting comparative data. But Mr. Copeland might well be reminded that the use of electricity for warming is already being widely adopted, and that can only be due to its superiority.

London, E.C.1, *October 21st.* J. Lesser.

Engineers and Economics

It is extremely interesting to note from your issue of October 13th that a group for the study of economics has been formed by the North-Western Centre of the I.E.E. It may interest some of your readers to know that a similar Study Group composed of mechanical and electrical engineers and technicians has been working along similar lines in London.

Meetings are held fortnightly at the Guild House, Eccleston Square, S.W.1, at 6.30 p.m. on alternate Tuesdays, the next meeting being on October 31st. All electrical engineers seriously interested in solving the problem of the present industrial and financial tangle will be cordially welcomed.

The hon. secretary of the Group is Colonel Johnson, M.I.Mech.E., Gunnersbury House, Hounslow, who will be pleased to forward reports and notices of meetings to all interested. M. I. Lipman, A.I.E.E.

London, N.2, *October 18th.*

Red Fir Poles

There are a very large number of creosoted red fir poles in use in this country, carrying electric power, telegraph and telephone lines, and after the recent exceptionally hot summer some may have shown signs of cracking or splitting.

I therefore wish to assure any engineers who may be worried by this occurrence that it is likely to happen in very hot weather; it is not detrimental either to the strength or life of the poles and the cracks will disappear when cooler weather comes. We have had a few complaints concerning this matter, but they were all accounted for by the excessive heat. In one instance some poles were returned because they were badly split, but on arrival at our works a few days later, the cracks had disappeared.

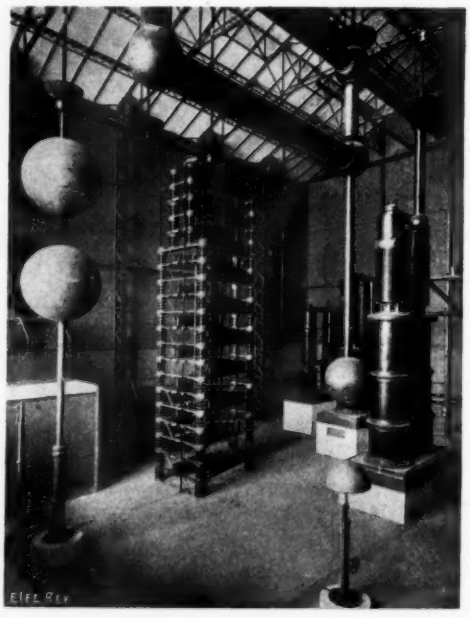
The above remarks apply to red fir, which is generally used for carrying overhead lines, but not to larch, which does crack, the cracks as a rule remaining open permanently.

Christopher Wade, A.M.I.E.E.,
Bedford, *Oct. 23rd.* (Gabriel, Wade & English, Ltd.).

A Three-million-volt Testing Laboratory

THE Compagnie Générale d'Electro-Céramique, of Ivry, Paris, maker of high-voltage insulators, whose one-million-volt [between one pole and earth] testing plant erected in 1923 is claimed to have been the first of such a capacity in Europe, has recently completed an addition to its "Ampère" laboratory.

By means of the new installation—which is due to M. Schuep and M. Sollima, two engineers of the Electro-Céramique Co., it is possible to produce lightning discharges up to three million volts at any desired speed, such discharges being recorded by a special Dufour type of 50,000 V cathode-ray oscillograph. The building, which is windowless, measures 118 ft. in length, 65 ft. in width, and 59 ft. in height. The roof has been carefully connected to earth in such a way that the building forms a sort of Faraday cage. The three old transformers giving one million volts and their 39-in. diameter discharging spheres and other equipment have been brought up to date.



General view of the three-million-volt laboratory

The new artificial lightning producer consists of one hundred 0.5 microfarad 30,000-V condensers mounted in the form of a tower, one above the other, built up entirely of porcelain insulators and square-section steel tubing connected by cast-iron fittings. The condensers are arranged in twenty sets of series-connected fives. The ten odd-number sets are linked in series by intermediary spark gaps to the apparatus to be tested, the ten even-number sets being similarly connected together, the whole being charged through resistances by a special d.c. generator and rectifier (kenotron).

The pressure applied to the condenser terminals is obtained from the secondary of a transformer, the primary of which is in series with an auto-transformer having twenty-six adjustable tappings. The primary circuit is itself linked up to an "insulating" 10-kVA transformer, its purpose being to separate the distribution system from the general installation.

The condensers are of the oil-immersed paper type set in metal sumps supported on insulators. One of the poles is connected to the sump and the other passes out by a plain cross-member. The maximum voltage depends on the spark gaps at the intermediary arcing points, which have to be adjusted with great precision, this being effected by two porcelain lines of a total length of about 78 ft. remotely controlled from the operating desk by a contactor. The earthing circuit of the battery of condensers is completely independent of that of the building; it comprises two pits extending below the level of the underground water of the River Seine in which the earthing plates are sunk.

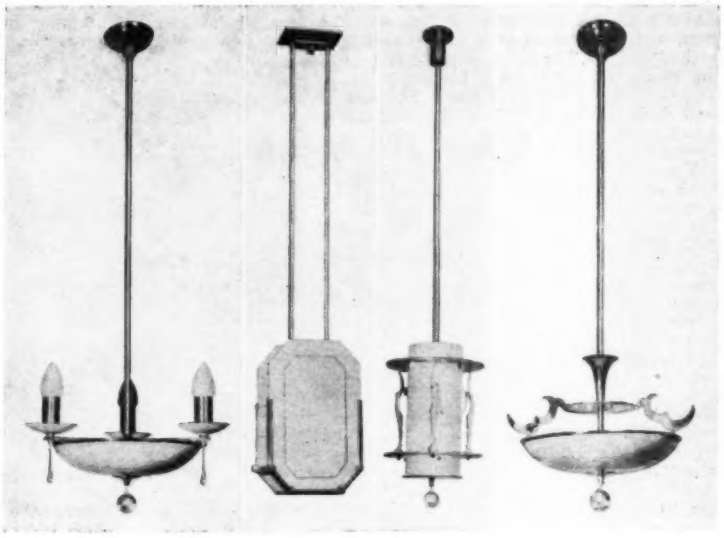
With all the condensers coupled in series a maximum of 3,000 A at three million V with an equivalent capacity of 0.005 mF is secured. With the twenty sets of five condensers coupled in parallel a maximum of 60,000 A at 150,000 V and an equivalent capacity of 2 mF is obtained. The total energy of the discharge is 22,500 joules and the maximum instantaneous power developed about nine million kW. To measure the potential of the arc two brass balls of a diameter of about 6½ ft. and each weighing about 10 cwt. are employed. The lower sphere is mounted on an adjustable hydraulic piston, while the gap between the two spheres is remotely measured by an optical method. At three million volts the length of the spark exceeds 13 ft.

New Apparatus and Devices

for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes

G.E.C. Lighting Equipment

The new lighting fittings produced by the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, W.C.2, for the 1933-34 lighting season include a number of very striking pendants. Four of these are illustrated herewith. The first (left) comprises three candle-lamp fittings with chromium-plated metalwork and amber, pink or green glass. The second is also chromium-plated and has amber glass panels relieved by etched lines. The next fitting is cylindrical, the satin-finish glass cylinder being mounted in a kind of cage consisting of two rings separated by four female figures. The last example has a similar bowl to the first, above which is an ornament with a reflecting disc supported by quaint devices.



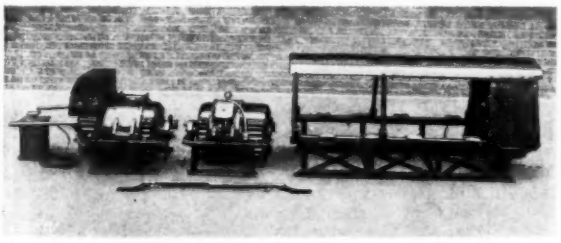
Four lighting pendants recently introduced by the G.E.C.

The " Electrotherm " Heater

The " Electrotherm " heater, priced at £4 18s., is a fire of unusual design. It is of the reflector type, and, it is claimed, has a radiant efficiency of 77 per cent. The maximum loading is 2 kW, with the two bar elements fixed horizontally. A double-pole switch enables one element to be cut out, and the frame, which is of sturdy construction (weight 21 lb.), measures 19 in. long by 9 in. wide by 14¼ in. high, and is finished in chromium plate. The very wide mesh guard which is provided protects the elements from mechanical injury. The manufacturers of the fire are ELECTROTHERM, LTD., Spring Hall Lane, Halifax, Yorks.

Permanent Way Reinforcement

For the reinforcement of permanent way crossings on electrified railways, the QUASI ARC CO., LTD., 15, Grosvenor Gardens, S.W.1, has produced a welding motor-generator. Both motor and generator have special yokes with their points of



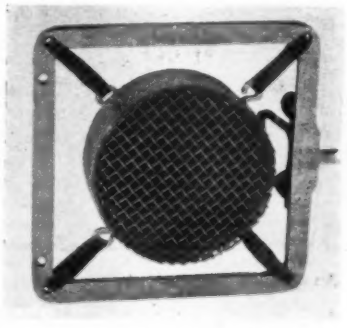
A " Quasi-Arc " traction-type welding set

fixing level with the centre line of the shaft; this feature is intended to avoid the possibility of the machines being thrown out of line as might occur through bending of the bed-plate due to the set standing on uneven ground.

The motor is compound wound and is designed specially to withstand sudden voltage fluctuations, which might occur in the traction supply from which it draws its current. The starter is fitted with a low-voltage relay cut-out, as if the supply voltage falls below a predetermined value welding conditions become unsatisfactory and welding should be stopped until normal voltage is restored; also a fall in voltage may be followed by a rapid rise, introducing a possibility of damage to the machine by the surge. The generator is of the company's " S.G " divided-pole type, with a drooping characteristic, having four ranges of series-field control and a close current adjustment from 25 to 225 A. The machine is self-excited and employs no stabilising resistance or reactance in the arc circuit. The standard portable hand grinder can be driven from the set. The set is assembled in a waterproof housing.

A " Double-cell " Microphone

A new " double-cell " carbon microphone has been developed by MARCONI'S WIRELESS TELEGRAPH CO., LTD., Electra House, Victoria Embankment, W.C.2, especially to provide high-quality performance at a comparatively low price. It has an unusually wide angle of pick-up and is capable of feeding a broadcast transmitter or speed amplifying system equally well, with the minimum of background noises.

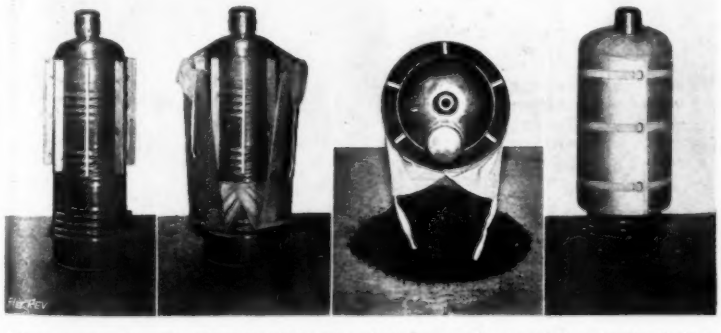


The new Marconi microphone

No adjustments are needed and the terminals are such as to enable the new type to be substituted for the Marconi-Reisz microphone without alteration to the circuits concerned. Up to four microphones can be used in parallel. This " Type M.i.g.7a " pattern consists of a double cell capsule in which a light diaphragm is completely covered with carbon. Each cell has a height of 2.5 cm. only, which reduces very considerably the tendency to pack, and the diaphragm is of a special stretched type which is waterproof. The instrument is sealed and is not liable to change its characteristics with weather or temperature. It may be suspended within a light metal frame, or inserted in a pedestal or handgrip.

A Lagging Jacket for Storage Tanks

According to the reports issued by the representative Domestic Water Heating Sub-Committee of the British Electrical Development Association upon the development of the water-heating load, very considerable interest has been shown in the conversion of existing domestic hot-water systems to electric heating by the fitting of circulators with thermostatic control. For this type of installation it is important for the cylinder to be efficiently lagged. Appreciating the demand for efficient lagging, MESSRS. DRAKE & GORHAM WHOLESALE, LTD., 77, Long Acre, W.C.2, have just placed upon the market the " Nolos " lagging jacket, which has been specially designed so that full advantage may be taken of the value of prepared granulated cork for heat insulation, together with ease of fitting and adaptability of the lagging jacket. The accompanying illustrations from left to right show how the lagging jacket is constructed around an existing tank. Eight standard sizes are available for cylinders from 12 to 24 in. in diameter, and from 30 to 48 in. high. Prices vary



The construction of a " Nolos " lagging jacket round an existing tank: (left to right) supporting ribs in position, covering the ribs, cork insulating material in place, and the finished tank

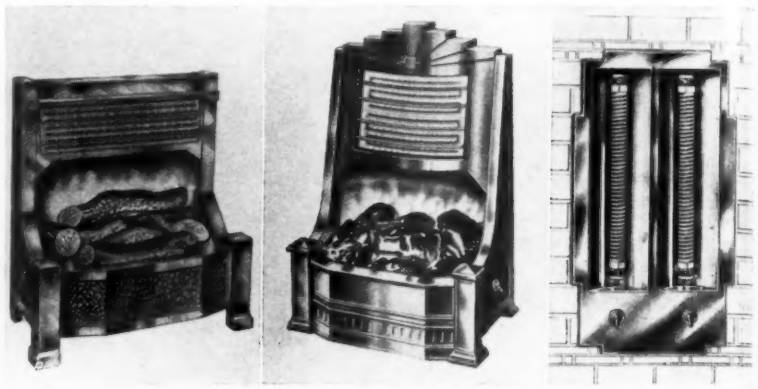
from 22s. 6d. to 31s., and other sizes can be made to order. The jacket can still be fitted when the tank is fixed close to a wall.

New "Revo" Fires

A large number of new fires has been introduced by the REVO ELECTRIC CO., LTD., Britannia Works, Tividale, Tipton, Staffs, this year. The "Renown" is an elegant imitation coal or log fire priced at £3 10s., in oxidised silver or bronze, and £4 12s. 6d. in florentine bronze. The frame is of cast iron, and a flicker effect is incorporated. Another new model is the "Saturn," available with 1-kW loading at 32s. and with 2-kW loading at 41s. This model, which has imitation coal fuel, is also provided with a flicker effect, and can be obtained finished in sprayed oxidised brass, silver, or bronze.

The new "Exelda" fire is available with either log or coal fuel at £5 5s. in sprayed brass, silver or bronze, florentine bronze costing 10s. more. The loading is 2.25 kW. Another attractive fire is the "Moderna," a non-reflector fire with a cast-iron frame, priced at 15s. 6d. (1 kW), and 25s. (2 kW) in sprayed oxidised brass, silver, or bronze. Vitreous enamel finish can also be obtained at a slight extra cost.

A representative example of the new inset fires is the "Futura"—this is also designed on modern lines and has a chromium-plated cast-iron front, and the two 1,000-W vertical firebars are set in front of parabolic reflectors. The prices are 27s. 6d. (1 kW) and 42s. 6d. (2 kW). A new reflector fire known as the "Sultan" has also been introduced, and is available in 1- and 2-kW sizes at 14s. 6d. and 21s. respectively, with a hammered copper reflector and finished in sprayed oxidised brass, silver, or bronze.



New Revo fires: The "Exelda," "Renown," and "Futura"

An Adaptable Lighting Bracket

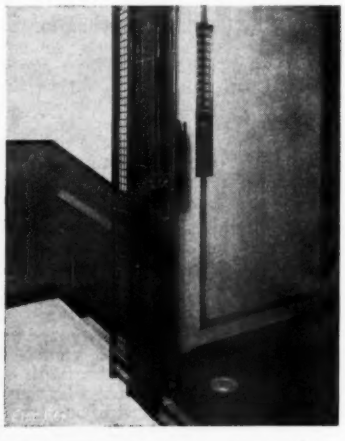
The "Mprolite" is a new lighting unit produced by MOULDED PRODUCTS, LTD., Chester Road, Tyburn, Birmingham. By changing the relative positions of its four component parts — back-plate, bracket arm, lamp-holder and cap—six or more different designs can be obtained, with the shade in the upright or downward positions, the arm either way, and with or without the back-plate, &c. The unit is available with or without a moulded shade, and any standard shade will fit it.

An "Mprolite" lighting bracket

The moulded bracket is available in a wide variety of colours, walnut, oak, mottled red, and so on, and a typical price is 10s. for a complete bracket without the optional switch in the back-plate. The bracket arm plugs into the plate. The range also includes pendant fittings for up to six lights.

High-speed Lift Control

"Auto-Pilot" control designed by MESSRS. MARRYATT & SCOTT, LTD., 75, Clerkenwell Road, E.C.1, simplifies the operation of high-speed lifts. The car control equipment consists of a small switch which is set by the driver in the direction in which he wishes to proceed, and a foot pedal which, when depressed, causes the lift to start and accelerate, and, when released, causes the lift to decelerate and stop at the next nearest floor. The stopping is entirely automatic and quite independent of the skill of the operator. The "load" in the car is electrically weighed, and an ingenious electrical braking system ensures a high degree of accuracy in "floor-finding" under the widely varying loading conditions.



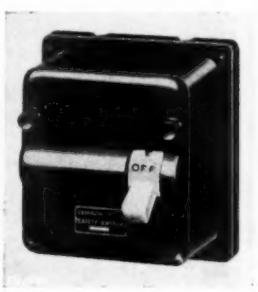
"Auto-Pilot" control equipment in a lift cage

An important feature is that both of the driver's hands are left free, so that the minimum of time is lost in the loading and unloading operations. The system includes a creeping speed, so that engineers who may have to travel on the top of the car during maintenance can work in safety, and inter-communication between waiting passengers and the lift driver, which ensures that all calls are answered in the quickest possible sequence, and that waiting passengers are informed by the driver that their call is receiving attention.

A disc immediately above the cage-summoning push is automatically illuminated as soon as the cage starts to move towards the passenger. The upper part of the driver's control panel comprises a series of relay-operated signal lights for calling the driver. Below the indicator panel is the master direction controller, and in the floor of the car is the "foot pedal" by which the lift is started.

Crompton "Minor" Motors

The new Crompton "Minor" motors briefly referred to last week, made by MESSRS. CROMPTON-PARKINSON, LTD., Bush House, W.C.2, are a modification of the original design. They include more convenient mounting of the terminal box; a new system of brush-lifting gear which has been proved in tests involving 250,000 starts and stops—equivalent to ten years' service; tandem brush-holders on the d.c. machines and radial brushes, preventing chattering and giving longer life; and modified feet giving a greater degree of interchangeability between a.c. and d.c. machines of similar ratings. In the majority of cases, fixing dimensions are the same for the whole range of speeds at one horse-power. It is claimed by the makers that the d.c. "Minor" is the only British machine embodying two brushes per arm which is interchangeable with the a.c. machine of similar rating.



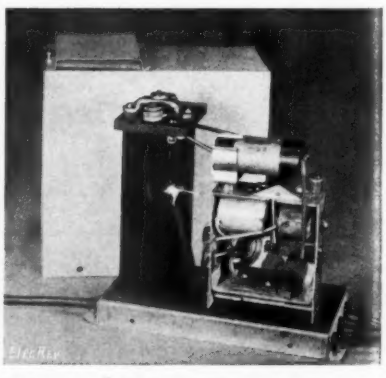
The safety switch of the new Crompton "Minor" motors

The machines include split-phase and repulsion-induction single-phase motors, two- and three-phase, and d.c. machines. They are available with sleeve or ball bearings, and with a variety of enclosures and mountings, flange and footless types.

A special new safety switch which is incorporated in these motors is illustrated.

Portable Neon Equipment

A recent development of NEON PORTABLE UNITS, LTD., 85, Alsen Road, N.7, is a portable battery outfit which affords both a suitable h.t. supply for neon lighting tubes and variable flashing. It will serve for up to forty feet of tube, and the bright, steady sustained flash is followed by a definite "black out." The rotating pinned wheel operation for the interrupter is entirely superseded by a thermal relay system. An ordinary six- or twelve-volt battery is a suitable supply unit.



Neon portable (battery) unit with the cover removed

Canadian Electrical Notes

FROM OUR CANADIAN CORRESPONDENT

THERE is in Canada a slow but definite growth of optimism resulting from a general feeling that conditions are improving. Since the beginning of the year—February is reported to have been the worst month—there have been increases in the number of employed persons, in the consumption of electric power, in customs receipts, and in other lines of sufficient magnitude to be worthy of notice. With regard to power, *Electrical News and Engineering* reports that the consumption of electricity for August this year was 20 per cent. greater than it was a year ago. The prospects for the winter are, however, that very many people will have to be helped with supplies of food, fuel, and clothing, as they have been for several winters.

The writer recently attended a convention of the Canadian Gas Association in Ottawa, at which were present a number of members of the Institution of Gas Engineers from home, as well as representatives of similar bodies from France, Belgium, Switzerland, and even Japan. The convention was very successful from the point of view of enabling men from different countries to interchange views and experiences and to learn something of the methods and practices adopted and the difficulties encountered by others. Once again, the question arises in one's mind as to whether the Institution of Electrical Engineers could not arrange a visit of this sort to Canada.

The gas engineers visited the great Beauharnois hydro-electric power station on the St. Lawrence, the Leaside sub-station of the Hydro-Electric Power Commission of Ontario in Toronto, and the Queenston-Chippawa development of the Commission at Niagara Falls, and expressed very great interest in these huge developments.

Where the "Electricals" are Lacking

Last year the mechanical engineers came here from Great Britain, and there is little doubt that, as their brethren the gas men must have done, they returned home with a new set of ideas regarding Canada and the latent possibilities of this country of vast extent and immense resources. Surely the I.E.E. cannot much longer refrain from paying an official visit to the Dominion—it might have the effect of creating a link between Canadian and British electrical engineers; one cannot speak of *strengthening* something that does not exist. There is a very strong link between the electrical men of this country and those of the United States, especially in the shape of active Canadian branches of the American Institute of Electrical Engineers.

It is a singular fact that the chemists here have their Canadian Institute of Chemistry and the gas engineers have their Canadian Gas Association, but the electrical engineers content themselves with being members of local branches of the A.I.E.E. Thus there is no central Canadian body of electrical engineers, as the various branches are only affiliated through the A.I.E.E. headquarters in New York. In other words, the Montreal, Toronto, Hamilton, Winnipeg, and other branches are not part of any Canadian organisation.

There is a Canadian Electrical Association, but it is run on the lines of, and was formerly affiliated with, the National Electric Light Association in the United States, which has recently been reorganised under the name of the Edison Electric Institute. The aims and objects of these bodies are different from those of the A.I.E.E., and the character of the membership is not the same.

At one time the Engineering Institute of Canada, which comprises civil and mechanical engineers and is supposed to include the electricals as well, made an attempt to take the various Canadian branches of the A.I.E.E. under its wing, but apparently the plan was largely a failure as the branches mentioned are still active while the electrical section of the E.I.C. is of relatively little account.

Electrical Gas Production

Last year, at its meeting in Winnipeg, the Canadian Gas Association heard a very interesting paper on "The Carbonisation of Coal with Electricity," a copy of which recently came into my hands. The paper describes experiments made by the Detroit Edison Co., first with a retort of three-tons capacity and later with one of thirty tons. These retorts are cylindrical-steel shells mounted vertically, and capable of being closed at the top and the bottom. Coal can be fed in at the top and coke taken out at the bottom. The thirty-ton retort was about 40 ft. high and 6 ft. in diameter.

Down the vertical axis of the cylinder was placed a core of coke breeze, and bituminous coal was packed around this core. An alternating current was passed through the core, which became heated—it is believed that the coke was contained in a cheap thin-walled iron tube and that the iron carried the current at first. The hot core transmitted its heat to the surrounding coal, which became carbonised in ever-widening concentric circles until the whole mass of the coal was converted into coke, the gases given off being collected in the meantime. In about twenty hours the charge was all converted into gas and coke, having taken about 350 kWh per ton of coal.

The company claims entire success for the process as to its satisfactory operation and the quality of the gas and coke yields. A very large sum of money was spent by the Detroit Edison Co., which operates a small gas plant as well as its electrical undertaking, and it is stated in the paper that the only reason why the process has not been adopted is because it was expected that natural gas would soon be brought into the city and district, with which the company could not compete.

The Lady Mayoress of Manchester (Mrs. W. Walker) presided at this luncheon of the Electrical Association for Women held at the Grand Hotel, Manchester, on October 17th

A Use for Off-peak Power

The plant is intended to utilise off-peak power, thus making cheap gas, but not so cheap as natural gas. In the discussion which followed the reading of the paper there seems to have been very little criticism of the process by the gas engineers, and this perhaps may be taken as indicating that the method has certain merits. One would imagine that the success of the process would be dependent upon having relatively short stoppages of current during on-peak periods, as otherwise the heat losses would be considerable and there might be difficulty in getting the retort into proper operation again after an unduly long shut-down. As pointed out by the author of the paper, a retort of large diameter and short length would retain heat better than one with these dimensions reversed.

There are some men in the world to-day, and I am one of them, who believe that electricity will play no inconsiderable part in the making of gas, before many years are over, either by some process such as that just described or by utilising electrolytic oxygen and hydrogen. The hydrogen is a fuel in itself and can be mixed with richer gas, while the oxygen could be used to make water-gas and would enable the process to be continuous instead of intermittent. Similarly, the oxygen could be used in the manufacture of a rich oil-gas. The problem hinges on the possibility of producing electrolytic oxygen and hydrogen at low cost. Cheap off-peak hydro-electric power may solve it, combined with a reasonable amount of storage capacity for the gases.

The English Washing-machine Market

Mr. G. A. Newman, the Assistant Canadian Trade Commissioner in London, has been investigating the market for electric washing machines in the United Kingdom. He is struck by the smallness of the number of machines sold. This he ascribes to the fact that the price of the machines is too high to come within the buying power of the public who most need them, while those who are in a financial position to purchase send their clothes to laundries. Mr. Newman, at the same time, refers to a new English washer retailing at about half the price of other models, and he thinks it probable that this new machine may create an entirely new price level in the English market, which will have to be considered by prospective Canadian and other exporters. Amongst other difficult factors which he mentions are the reluctance of wholesalers to consider any proposition that would involve the carrying of stocks; the indifference of the public to the advantages of electrical washing machines; and the expense of effecting even small sales. He therefore advises Canadian firms who contemplate entering the British market to consider first to what extent they can afford to provide a competent selling organisation and demonstrators; servicing depôts and assembling plant, &c.; and advertising.

New Books

Industrial Electrical Measuring Instruments. By K. EDGCUMBE and F. E. J. OCKENDEN. Pp. 553; figs. 392. London: Sir Isaac Pitman & Sons. Price 25s.

The previous edition of several years ago is now completely rewritten and brought as up to date as rapid advances in the science make it possible. The book is very readable and is well printed; it is likely to be the instrument designers' and manufacturers' standard for some time, in addition to its use as a text book for students and instrument users. It is only by the perusal of such a book that one can realise the improvements and advances in instrument design and accomplishment, the individual advances being so numerous as to be almost unnoticeable.

The book deals with theory and practice; in general the former is the more complete. As the authors are manufacturers as well as designers they have drawn largely on their own instruments for examples. Whilst this by no means makes the book an advertisement examples as to range and consumption of instruments, to name but two features, would be more complete if all other makers' instruments had been studied and the best figures given. Whilst instrument design is now on a scientific basis it is far from being mathematically precise and it is in the different ways of designing an instrument to a given theory that makers differ, except perhaps in such a stereotyped instrument as the moving coil. Practically all types of indicating instrument are covered, including rectifier instruments, whilst there are two chapters dealing with measurements as apart from instruments. The exclusion of integrating meters from the scope of the book makes the indiscriminate use of the word "meter" rather misleading.

Whilst it is obvious that many published papers have been studied few are referred to; references to more of these would be of assistance. One feature of present-day instrument manufacture is the tendency towards smaller instruments; this is not brought to light and whilst it does not affect general theory it does alter such important factors as minimum range and consumption. For example 2½-in. moving iron instruments consuming less than 0.25 VA and having resistances of over 200 ohms per volt for voltmeters for 100 volts and over; also induction instruments in similar sized cases. The table of power consumption (p. 109) gives no indication of these low figures. The inclusion of thermo-e.m.f. instruments in this table is also called for, hot-wire instruments having been largely displaced by them, except as tuning indicators.

There is much useful information on jewels and springs in easily applied form. Types of instruments include recent types such as the ionic wind voltmeter, shadow index scales and various remote indication systems. Instrument transformers are well covered and some references to recent papers on their testing are included. A table of symbols is provided and follows the I.E.C. and B.S.I. standards. The use of κ for ϵ in the text is the only noticeable departure from the standard symbols. The book can be well recommended to instrument designers, manufacturers, students and users.

Worked Examples for Wiremen and Students. By H. REES. Pp. 114; figs. 23. London: Sir Isaac Pitman & Sons, Ltd. Price 3s. 6d.

This is a concise and neatly arranged primer for the first year student or practical electrician who desires to acquire the essentials of d.c. circuit calculations. It should prove useful among the many evening classes now being held for apprentices and tradesmen and can be recommended to others studying privately. For those preparing for the City and Guilds or Association of Mining Electrical Engineers examinations the working of the examples provided will prove most helpful.

In each of the nine chapters the author shortly and clearly sets down the principles of his subject and follows with a well chosen set of worked examples. These inspire confidence to tackle the relative series of questions listed at the conclusion of the chapters. Answers are provided at the end of the book. In spite of the apparently necessarily hackneyed range of the subject matter, Ohm's Law, power, energy and heat, measurement and elementary machine calculations, the author has succeeded in giving a certain individuality to this primary text book.

Electrical Transmission and Distribution. By E. T. A. RAPSON. Pp. 179; figs. 112. London: Oxford University Press. Price 12s. 6d.

Based on lectures delivered by the author to technical college students, this volume covers the more theoretical parts of the professional examination syllabuses in transmission and distribution, and constitutes an excellent introduction to the more advanced study of the subject. To an unusual degree for so relatively small a book, it deals with all sides of transmission and distribution, with overhead and underground lines for long and short distances, high and low voltages, with electrical characteristics mainly, but not overlooking mechanical principles, economic aspects, and operating phenomena. Where the treatment is necessarily brief and restricted, the author shows excellent judgment in the selection of his material. The reader is, of course, expected to be familiar with the calculus and hyperbolic functions.

The fact that the book is based essentially on existing conditions and practice in Great Britain, and takes full cognisance of the grid, greatly increases its value to students. The introduction is a model of lucid explanation concerning the relative merits of d.c. and a.c. Here, and throughout the book, numerical examples are worked, and there are set problems with answers. Separate chapters are devoted to the determination of economical conductor sizes; the calculation of stresses in lines; types and testing of insulators; and the construction and characteristics of underground cables. An excellent chapter on feeder protection is followed by one on the primary constants of transmission lines, which might perhaps have been placed earlier in the book. The concluding chapters, on travelling waves, corona and the British grid system respectively, are followed by a summary of formulae and a good index. The student who works properly through this book has nothing to fear from examiners and is well-equipped for practice.

The Principles of Electric Welding. Metallic Arc Process. By R. C. Stockton, A.I.M.M. Pp. 184; figs. 73. London: Sir Isaac Pitman & Sons, Ltd. Price 7s. 6d.

Electric welding now occupies a very important position in engineering and constructional operations, and the literature, technical and patent, that has grown up around the various processes and methods devised is already very extensive. The title of this book gives a fair indication of its purpose, which is to state the principles underlying the metallic arc process of welding in a manner suitable for operatives or potential metallic arc welders. More recondite treatises must be consulted for a more detailed and complete treatment, but this is no disparagement of the author's effort, who, profiting it may be supposed by his practical and teaching experience, has reduced the subject to the simplest terms. He has avoided the use of symbols in a large measure but makes liberal use of well prepared illustrations. To the engineering student, the book will perhaps be of more direct and permanent value, due very largely to the greater use he has for the actual application of the principles involved.

The practical nature of the text is evident from the information on the testing of welds, weld metal and welded work, which is of much interest to the engineer. The final chapter sets out data regarding the heat used at the arc, factors on which the current strength depends, welding data for butt and lap joints, together with tables detailing the physical properties of metals, alloys and refractory materials. In books dealing with welding technique, there is scope for considerable variety in the methods adopted, and there is a place for any of these in engineering literature provided they be fundamentally sound.

Sparks from the Electrode. By C. L. Mantell. Pp. 127; figs. 11. Baltimore: The Williams & Wilkins Co. London Agents, Ballière Tindall & Cox. Price 5s.

This little book, written in popular language, gives a comprehensive survey of the chief landmarks in electro-chemical development, with particular reference to the utilisation of water-power from the Niagara Falls. The book opens with a brief description of Sir Humphrey Davy's experiments and ends with talks of products of the electric furnace and the electrolytic cell, the intervening chapters describing various electro-chemical processes.

* * *

Shorter Notices

"Radio Upkeep and Repairs for Amateurs," by Alfred T. Witts. Pp. 158; figs. 103. London: Sir Isaac Pitman & Sons. Price 5s.—This book has been compiled for the average radio receiver owner who has neither the technical knowledge nor the patience to enable him to study theoretical principles. It is a book of simple instructions, enabling him to find out first, what has gone wrong, and then, if it is within his powers, how to put it right.

"Commercial Cinematography," by G. H. Sewell. Pp. ix+180; figs. 64 (7s. 6d. net); "Electrical Measurements and Measuring Instruments," by E. W. Golding, B.Sc.Tech., A.M.I.E.E. Pp. x+794 (illus.) (20s.); "Office Administration for Manufacturers," by R. A. Mills (10s. 6d.). London: Sir Isaac Pitman & Sons, Ltd.

"Experimental Electrical Engineering" (Vol. I), by V. Karapetoff (37s. 6d.); "Electrical Circuits and Machinery" (Vol. I), by J. H. Morecroft (25s.); "Electron Tubes and their Application," by J. H. Morecroft (28s.). London: Chapman & Hall.

"Fifty Tested Wireless Sets," by F. J. Camm (2s. 6d.); "Dictionary of Wireless Terms," by R. Stranger (2s. 6d.); "Elements of Wireless," by R. Stranger (3s. 6d.); "Wireless Constructor's Encyclopædia," by F. J. Camm (5s.). London: George Newnes.

"An Introduction to Aerodynamics, with notes on the aerofoil theory as applied to the design of aeroplane propellors and axial flow fans," by R. Poole. London: Draughtsman Publishing Co. Price 2s.

"Text-book of Physics," Vol. III (Electricity and Magnetism," by E. Grimsehl. London: Blackie & Sons, Ltd. Price 25s.

"Automobile Electrical Equipment," by A. P. Young and L. Griffeths. London: Iliffe & Sons. Price 15s.

"The Wizard in the Wall"

E.D.A.'s Advertising Campaign

LAST week-end a new series of advertisements arranged for by the Council of the British Electrical Development Association made their appearance in various London daily newspapers, Sunday papers, and selected journals. We are glad that London was chosen as the ground for opening the attack, for it is here that gas propaganda has been particularly active.

This is part of the Association's Autumn Press Campaign, which will continue throughout November and December. We reproduce two of the examples that have been published, and we learn that other advertisements are to follow. The papers in which the announcements are appearing have been chosen because they are considered specially suitable to reach the twelve million households of the country.

The campaign has been undertaken with the object of awakening the nation to the advantages of electrification, to increase electrical consciousness, to remove prejudice, to pave the way for intense electrical selling, and to lead to the more specialised schemes of propaganda which will follow what is described as "this first foundational campaign under the new E.D.A. régime."

In issuing these advertisements in a green cover bearing the words "The Wizard in the Wall" stress is laid upon the importance of linking the national campaign to local effort in three ways: (1) by displaying the circulated reproductions, or a photogravure poster, in electricity showrooms during the national advertising period; (2) by publishing similar messages in the local Press; (3) by making the electricity showroom an attraction drawing the public in search of news regarding tariffs, assisted-wiring schemes, hire and hire-purchase facilities and prepayment meters.

As the Press Advertising Campaign is "the beginning of a great electrical offensive," those responsible for the control and management of electricity undertakings are urged at once to "begin to enlist and train an efficient sales organisation sufficient in its ultimate strength to penetrate the non-electrical and anti-electrical strongholds."

The Wizard in the Wall . . .
Will somebody please tell us why some women slave away like drudges at household tasks which can be done quicker, cheaper, better by electricity! If they haven't heard of electric cooking, electric water* heating, electric cleaning and electric ironing — surely their husbands have?
THERE IS NEWS FOR YOU AT YOUR ELECTRICITY SHOWROOMS
LIGHTING
HOT WATER
HEATING
COOKING
WASHING
The Wizard in the Wall . . .
Why do you work so hard, when electricity will do most of the hard work for you? Why do you spend hours doing out a room when an electric cleaner will do it in a few minutes? Why do you carry coal and ashes and waste precious time cleaning fireplaces when you can use electric fires?
THERE IS NEWS FOR YOU AT YOUR ELECTRICITY SHOWROOMS

Two of the new E.D.A. advertisements

Swiss Foreign Electrical Trade

THE following statement, based on the official returns, shows the chief items of Switzerland's exports and imports of electrical goods, with countries of destination or origin, together with the increase or decrease in value compared with 1931.

From these figures it will be noticed that Switzerland is a larger importer than exporter of accumulators and batteries, but that the United Kingdom does not figure in the returns as an importer. She also is a larger importer than exporter of telegraph and telephone apparatus, the trade in which—doubtless because of the demand for radio material—was the only branch that was maintained. Switzerland also imports more lamps than she exports. The decline in exports of dynamo-electric machines and transformers was considerable, especially the shipments to France and Germany, but the market is still wide.

Exports

	1932. Thous. fr.	Inc. or Dec. Thous. fr.
Dynamo-electric machines and transformers—		
Total	9,040	— 18,210
To Germany	500	— 3,090
,, France	1,470	— 3,090
,, Italy	540	— 710
,, Belgium	440	— 930
,, United Kingdom	100	— 940
,, Spain	980	— 1,590
,, Poland	65	— 335
,, Rumania	130	— 590
,, Holland	510	— 390
,, Denmark	230	— 390
,, Yugoslavia	190	— 435
,, Russia	150	— 370
,, Egypt	270	— 120
,, Morocco	450	+ 330
,, West Africa	450	+ 435
,, China	230	— 220
,, Venezuela	410	+ 40
,, Argentina	560	— 1,480
Accumulators and batteries—		
Total	860	— 75
To France	492	+ 158
,, Italy	72	— 65
Insulators, mounted—		
Total	36	— 276
Elec. cable, not insulated—		
Total	1,190	— 180
To Austria	13	— 107
,, Italy	350	+ 35
,, United Kingdom	390	— 180
,, Belgium	150	+ 10
Cable, insulated, not lead-covered or iron-armoured—		
Total	320	— 260
To France	115	— 95
,, Holland	90	— 40
Cable, lead-covered—		
Total	20	— 40
Cable, lead-covered and iron-armoured—		
Total	4	— 95
Cable, insulated with rubber or paper and covered with textile—		
Total	50	— 200
To United Kingdom	10	— 140
,, India	4	— 30
Cable, ditto, lead-covered—		
Total	9	— 103
To United Kingdom	4	— 14
Elec. locomotives—		
Total	710	+ 80
To France	695	+ 695
Telegraph and telephone apparatus—		
Total	700	— 420
To France	150	— 35
,, Italy	195	— 60
,, Germany	140	— 20
,, Greece	9	— 166
,, United Kingdom	25	— 50
Incandescent lamps—		
Total	1,240	— 2,230
To Germany	950	— 100
,, Belgium	33	— 107
,, Holland	25	— 1,035
,, Rumania	32	— 98
,, Denmark	5	— 235
,, Turkey	41	— 99
Electric meters—		
Total	10,990	— 5,790
To France	2,620	— 450
,, Belgium	1,320	— 480
,, United Kingdom	1,640	— 1,060
,, Czechoslovakia	910	— 330
,, Holland	950	— 530
,, Japan	60	— 410
Elec. apparatus not elsewhere mentioned—		
Total	5,510	— 8,860

Imports

	1932. Thous. fr.	Inc. or Dec. Thous. fr.
Dynamo-electric machines and transformers—		
Total	2,500	— 1,330
From Germany	1,600	— 520
,, France	215	— 125
,, United Kingdom	170	+ 55
,, U.S.A.	210	— 90
Accumulators and batteries—		
Total	1,980	+ 273
From Germany	490	— 118
,, France	135	— 145
,, Belgium	610	+ 574
,, U.S.A.	240	+ 50
Insulators, mounted—		
Total	730	— 400
From Germany	390	— 350
,, Denmark	150	— 70
,, U.S.A.	155	— 5
Elec. cable, not insulated—		
Total	85	— 75
From France	40	— 75
Cable, insulated, not lead-covered or iron-armoured—		
Total	250	— 140
From Germany	150	— 150
Cable, lead-covered—		
Total	220	— 160
From Germany	200	+ 147
Cable, lead-covered, and iron-armoured—		
Total	100	— 260
From Germany	95	— 262
Cable, insulated with rubber or paper and covered with textile—		
Total	510	— 80
From Germany	230	— 20
,, Belgium	150	— 95
Cable, ditto, lead-covered—		
Total	215	— 125
Telegraph and telephone apparatus—		
Total	24,620	— 30
From Germany	8,890	+ 370
,, Austria	680	— 100
,, Belgium	2,740	— 1,600
,, Holland	4,750	+ 2,080
,, United Kingdom	860	+ 190
,, U.S.A.	5,840	— 990
Incandescent lamps—		
Total	2,790	— 300
From Holland	990	— 30
,, Germany	960	— 220
,, Austria	280	+ 10
,, Hungary	300	— 105
Elec. meters—		
Total	530	— 250
From Germany	430	— 220
Elec. apparatus not elsewhere mentioned—		
Total	3,540	— 1,565
From Germany	2,300	— 930
,, Belgium	890	— 490
,, United Kingdom	130	— 10

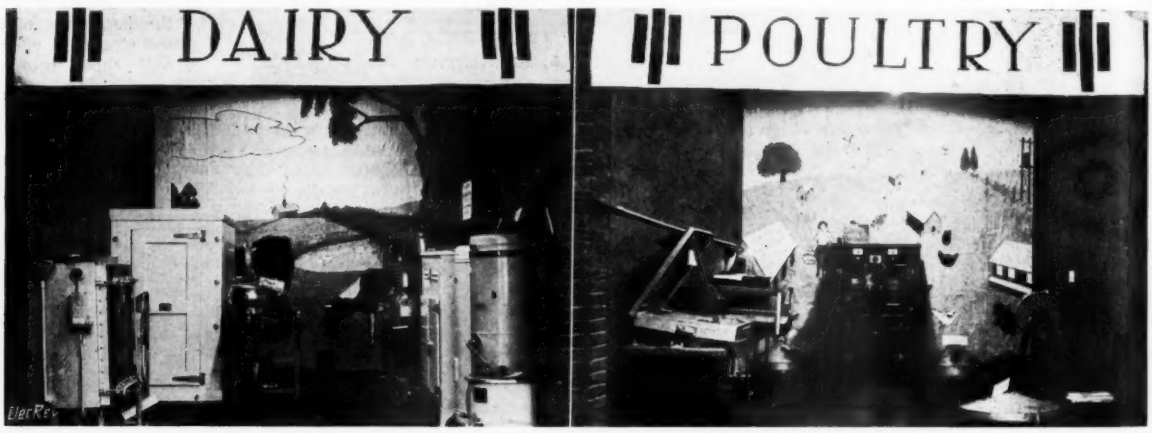
Business and Industrial Notes

The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments, Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations, and Failures

An Electrical Week at Aylesbury

As a crowning event to the numerous exhibitions arranged by the Aylesbury Corporation Electricity Department throughout its area, and the close advent of the completion of the Aylesbury extended area of supply, an electrical exhibition was opened at the electricity showrooms by Mr. M. W. Beaumont, M.P., on Saturday last. The electricity undertaking has an area of supply of 230 sq. miles, with a total population of 57,548, over 44,000 of whom reside in the rural area. The number of villages receiving a supply totals 104, and 179 farms are connected. The exhibition, which closes to-morrow (Saturday), is therefore largely arranged to show the applications of electricity to farming and agriculture. It comprises twenty sections, representing fifty-three manufacturers, and includes bread baking, commercial and domestic cooking and heating, electric dairy and farming apparatus, electric poultry rearing, greenhouse hot-beds, pumping, water heating, &c. The poultry, dairy, pumping and agricultural sections have been accommodated at the back of the showrooms in the Department's garages; practically every exhibit is wired and clearly labelled. The two main showrooms normally house the domestic and agricultural sections, and while the domestic section remains, the agricultural showroom has been taken for the all-electric bakery and commercial cooking equipment.

There is also a scientific section in which television, oscillographs, surge absorbers, and invisible ray apparatus are prominent. Additional attractions are an illuminated waterfall, and the floodlighting of the showroom frontage. Lectures have been given each day during the week on electricity in the home and in farming, while visits have been made by children from schools in the surrounding districts. An extensive publicity campaign has been carried out, and in addition to circularising all consumers, special notices have been sent to tradesmen and other specialised consumers drawing attention to particular exhibits likely to prove of special interest. Sound films describing the exhibition have been shown in the leading cinemas in Aylesbury and district.



The dairy and poultry exhibits at the Aylesbury electrical exhibition

Employment During September

The *Ministry of Labour Gazette* states that during September employment in the engineering industry showed a general improvement, but was still very slack on the whole. The total out of work was 203,208, a decrease of 12,027, the percentage falling from 22 to 20.8. In electrical engineering employment was fair; the number of unemployed fell from 12,886 to 11,755, and the percentage from 13.7 to 12.5. In the electric cable, wire, and lamp-manufacturing group there was an improvement, those out of work numbering 12,993 (11.1 per cent.), as compared with 13,844 (11.8 per cent.) in August, while a decrease of from 4,784 to 4,645 (from 19.1 to 18.5 per cent.) was recorded for the electrical wiring and contracting industry.

The Domestic Appliance Market in Peru

The Commercial Secretary to H.M. Legation at Lima has prepared a report on the market for domestic electrical appliances in Peru, which has been issued by the Department of Overseas Trade. This states that while the reduced purchasing power of the Peruvian currency has seriously affected the volume of imports into Peru during recent years, the sale of domestic electrical appliances has continued uninterruptedly. Many of such appliances in common use in other parts of the world are, however, almost unknown in Peru, partly for the reason that the cost of electricity is high and partly because electricity supply is limited and unreliable in many provinces. In Lima and the surrounding districts a reliable supply at 220 V 60 cycles is available, but there are only thirteen other cities in Peru where a fairly satisfactory, but by no means reliable, supply of electricity is provided.

Much has been done to popularise domestic electrical appliances in Peru by the Lima Light & Power Co., but the demand for radiators, fires, cookers and vacuum cleaners is very poor. Small electric domestic apparatus, such as irons, kettles, toasters, hair-dryers, portable torches, &c., maintain a fair sale, however.

A Northmet Pocket Memo. Pad

We have received a handy pocket memo pad from the North Metropolitan Electric Power Supply Co. which it is distributing to prominent people in its area. The pad has a black leather jacket, and a pocket for stamps, &c.

Commercial Officers' Visits

The Department of Overseas Trade announces that Mr. J. G. Lomax, Commercial Secretary to H.M. Embassy at Rio de Janeiro, and Mr. H. A. N. Bluett, Commercial Agent at Batavia, are now in this country on official visits. Mr. Lomax will be available at the Department of Overseas Trade from November 1st to 10th, and Mr. Bluett from November 24th to December 1st for the purpose of interviewing manufacturers and merchants interested in the export of United Kingdom goods to Brazil and the Netherlands East Indies respectively. At a later date they will visit a number of provincial towns. Firms desiring interviews or information regarding the visits to provincial centres should apply to the Department at 35, Old Queen Street, S.W.1.

Plastic Moulding Machines

Members of the London and Midland sections of the Institute of the Plastic Industry are to visit the Coventry works of Alfred Herbert, Ltd., on November 8th, to witness a demonstration of machines suitable for the production of moulds for plastic materials. A cordial invitation is extended to anyone interested in the production of such moulds to see this demonstration. Visitors are asked to notify the company of their intention to be present.

The Scottish Contractors' Year Book

The Year Book and Diary, 1933-34, of the Electrical Contractors' Association of Scotland, which has just been published, is on much the same lines as previous editions. In addition to details of the objects and activities of the Association, the present edition contains a number of articles of interest to the electrical contractor. The literary matter is preceded by portraits of Mr. D. Bennett, president of the Association for 1933-34, Mr. A. J. Shand, the vi e-president, Mr. W. Finlay, the secretary, and the chairmen of the various branches.

Radio Apparatus in Germany

Under the so-called "Wirufa" agreement between the makers of radio apparatus in Germany the radio trade is being concentrated, and only dealers recognised by the Verband der Funkindustrie will in future be supplied with apparatus, the object being to prevent the abuses which have existed in the past, especially in the matter of rebates granted to customers. In this connection a representative of the

Verband recently stated that out of the former 60,000 dealers in radio apparatus 25,000 have been permitted to remain in the trade, and negotiations are proceeding with another 5,000, the rejections numbering 10,000, while the 20,000 who have not replied to the questionnaire sent out by the Verband will be excluded from trading. In the near future a sum of 10,000,000 marks is to be rendered available for financing the instalment trade in the new "national receiver," so that dealers will be able to sell this particular set on the basis of monthly payments of from 3 to 5 marks.

Elma Activities

A large number of representatives of supply undertakings, electrical contractors, the retail trade, and manufacturing firms attended the first lecture of the twenty-eighth Illumination Design Course, held on October 16th, at the E.L.M.A. Lighting Service Bureau. The opening remarks, which were made by Mr. W. F. Moir, chairman of the E.L.M.A. Council, were followed by a lecture on "The Electric Lamp—Its Characteristics and Functions in the Lighting Installation," by Mr. L. E. Buckell. The programme has been arranged to assist members of the industry who are in direct touch with the public to acquire a sound practical knowledge of the principles of good lighting. The subjects to be dealt with throughout this course have been so arranged as to make it possible for the lecturers to give the most up-to-date information obtainable about modern lighting tendencies throughout the world. The second meeting was held on October 23rd at the Lighting Service Bureau, when Mr. H. C. Wheat, A.M.I.E.E., lectured on the subject of "The Lighting Fitting—Its Development, Purpose, and Design."

Eighteen lectures have been given by the staff of the Lighting Service Bureau Touring Demonstration during the last three weeks, to audiences totalling some 1,100 people, in various towns in the South-West of England. The programme of the demonstration is as follows: October 30th, Monmouth; November 6th, Kidderminster; November 13th, Evesham; November 20th, Birmingham.

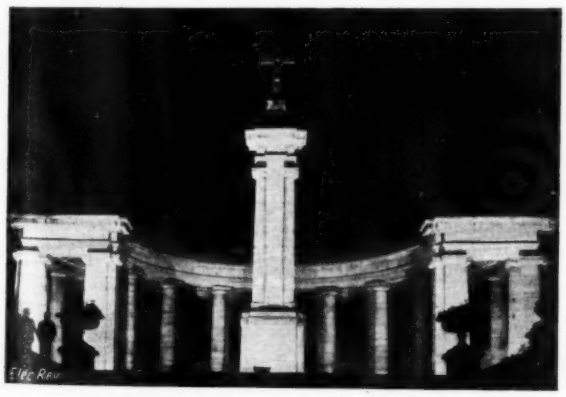
Mr. L. E. Brickell lecturing at the Lighting Service Bureau

A Price Correction

The British Vacuum Cleaner & Engineering Co., Ltd., informs us that the price of its "Clean Sweep" vacuum cleaner is £6 16s. 6d., and not 16 guineas, as stated on page 500 of our October 13th issue.

Huddersfield War Memorial Illumination

The accompanying view is of the War Memorial at Greenhead Park, Huddersfield, which has recently been illuminated by means of a battery of G.E.C. floodlights equipped with "Osram" lamps. This imposing structure, under floodlighting treatment, is visible from a distance of three miles, and



G.E.C. floodlighting of a War Memorial

forms a striking landmark from many points of the district. The scheme of illumination was carried out under the supervision of the Huddersfield electrical engineer, Mr. J. W. Turner, M.I.E.E.

"Electrical Housekeeping"

We have now received a copy of the new quarterly publicity magazine—*Electrical Housekeeping*—issued by the Electrical Development Association. As already stated, it is intended for circulation by electricity supply undertakings as part of their efforts to stimulate the domestic load. It is the Autumn (October) number, and not only has the first edition been sold out, but a reprint is in the press, and further orders cannot be accepted. On the whole, its contents regarding cooking, warmth, laundry economy, and half-time housework are well suited to its purpose. The second issue, which will appear about the end of November, will be a Christmas number.

A Portsmouth Electrical Exhibit

The Portsmouth Corporation stand at the recent local General Trades Exhibition, which was designed and erected by the British Electrical Development Association, was arranged with alcoves at the four corners in which were demonstrated lighting, cleaning, heating, and small appliances. Between the alcoves at each long end of the display lighting demonstration cabinets were installed dealing with such matters as optical comfort, speed of vision, &c. A panel running the entire length of the stand had on one side an elongated demonstration kitchen, and seating facilities were provided for people watching the demonstrations. On the other side the space was divided into three sections, illustrating a bathroom, a lounge, and a home solarium and health appliances. In addition to the demonstration lighting, for which proper arrangements were made in each of the sections, the stand was illuminated by means of 100 lamps concealed in specially designed reflectors behind the facia.

Trade Announcements

The telephone number of Messrs. Marelli & Co., Ltd., 19 and 20, Garlick Hill, Queen Victoria Street, E.C.4, has been altered to "Central 3621."

Wiring, Ltd., electrical engineers, have opened a business at 76, Seymour Place, W., and will be carrying on the connection of Messrs. Weenen, Goddard & Co.

Mr. R. Furse, electrical and radio engineer, has opened new central premises at 23, Joy Street, Barnstaple.

Mr. W. Hird, late of Hird & Fox, has commenced his own business at 46, Church Street, Gainsborough.

The Wholesale Electric Co., Ltd., 37, Vauxhall Bridge Road, S.W., has changed its telephone number to Victoria 4833/4/5.

The M.-V. Debating Society

Lord Stanley, of Alderley, opened the first debate of the session at the Metropolitan-Vickers Debating Society on Friday last. The meeting was held at the M.-V. Club, Moss Road, Stretford. His Lordship's motion was: "That War is unnecessary for the settlement of International Disputes." Mr. A. P. M. Fleming opposed the motion; there was a very lively debate, and many would-be speakers were crowded out. The motion was carried by 157 votes to 69.

Wages in the Cable-making Industry

The Joint Industrial Council for the Electrical Cable-making Industry announces that there will be no "cost-of-living" alteration in wages paid in the industry on the third pay-day in November.

The Cheshire Dairy Show

At the recent annual two-day Cheshire Dairy Show the Chester Corporation Electricity Department displayed in operation electrical apparatus for use on the farm, including domestic, dairy and barn requirements.

Recent Contracts

The new Cell Barnes Mental Colony, Hertfordshire, opened by Sir Hilton Young, Minister of Health, on October 5th, is one of the most completely electrically equipped institutions in the country. The Colony consists of a large number of buildings, the architects for which were Messrs. J. M. Sheppard & Partners. Electrical Installations, Ltd., were the electrical contractors, and they used large quantities of G.E.C. material in electrically equipping the Colony. Approximately 40,000 ft. of "Magnet" "Silverlac" conduit, 50,000 yds.

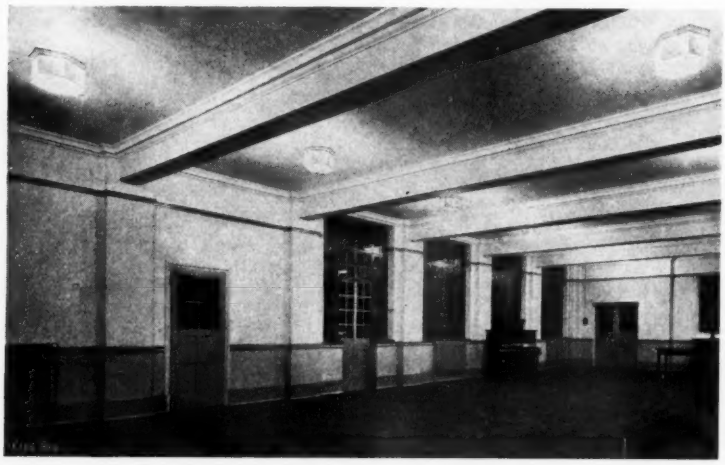
of v.i.r., p.g. braided cables, and 6,000 yds. of paper-insulated main cables were employed in the scheme, in addition to 4,050 yds. of multicore telephone cables, 4,000 yds. of bell wire, 1,200 " Magnet " tumbler switches, and 1,500 " Osram " lamps. Complete G.E.C. automatic telephone, fire alarm, and bell systems are installed, as well as a main switchboard.

For Sale

Newcastle-on-Tyne Corporation transport and electricity undertaking has for sale a Bellis engine, a battery booster, an 11-kW dynamo, and a 60-cell accumulator.

The County of London Electric Supply Co., Ltd., invites offers for the purchase of transformers and switchgear.

Manchester Corporation has for disposal motors, starters, &c. (See our classified advertisements.)



Siemens lighting fittings in a Leytonstone school

Prices of Materials

The following prices are only general, and they may vary according to quantities and other circumstances :—

CHEMICALS, ETC.	Price, October 25th.	Fortnight's Inc. or Dec.
a Acid, Oxalic ... ... per cwt.	50s.	—
a Ammoniac, Sal ... ... per ton	£40	—
a Ammonia, Muriate (large crystal) ... ,,	£38	—
a Borax ... ... ,,	£17	—
a Copper, Sulphate ... ... ,,	£19 15s.	—
a Potash Chlorate ... ... per lb.	3¾d. to 4¼d.	—
a ,, Perchlorate ... ... ,,	6d.	—
a Shellac T.N. ... ... per cwt.	£3	—
a Sulphur Commercial... ... ... per ton	£11	—
a ,, Roll ... ... ,,	£11	—
a Soda Chlorate ... ... per lb.	3¼d. to 3¾d.	—
a ,, Crystals ... ... per ton	£5 to £5 5s.	—
a Sodium Bichromate, casks ... ... per lb.	4d. less 6 per cent.	—
METALS, ETC.		
b Aluminium, Ingots ... ... per ton	£100 to £105	—
b ,, Wire ... ... per lb.	1/1 to 1/9	—
b ,, Sheet and Foil... ... ,,	1/2 to 2/9	—
p Babbits Metal and Anti-friction Metals—		
Grade I ... ... per ton net	£200	£2 dec.
Grade II ... ... ,,	£138	—
Grade III ... ... ,,	£67	—
c Brass (rolled metal 2" to 12" basis) per lb.	7¼d.	—
c ,, Tubes (solid drawn) ... ... ,,	9d. to 9½d.	—
c ,, Wire, basis ... ... ,,	7⅝d.	—
c Copper Tubes (solid drawn)... ... ,,	10½d.	—
g ,, Bars (best selected)... ... per ton	£64	—
g ,, Sheet ... ... ,,		
g ,, Rod ... ... ,,		
d ,, (Electrolytic) Bars ... ... ,,	£42	—
d ,, Sheets ... ,,	£64	—
d ,, ,, Wire Rods ... ,,	£45	£1 dec.
d ,, ,, H.C. Wire ... per lb.	7¼d.	¼d. dec.
f Ebonite Rod ... ... ,,	1/3 to 1/6	—
f ,, Sheet ... ... ,,	1/3 to 1/6	—
n German Silver Wire ... ... ,,	2/2	—
h Gutta-percha, fine ... ... ,,	nom.	—
h India-rubber, Para fine ... ... ,,	4½d.	—
i Iron, Pig (Cleveland No. 3) ... per ton	62/6	—
i ,, Wire, galv. No. 1, P.O. qual. ,,	£20	—
g Lead, English Pig ... ... ,,	£13	5s. dec.
g Mercury ... ... per bot.	£9 10s. to £10	—
e Mica (in original cases) small ... per lb.	6d. to 3/6	—
e ,, ,, medium ... ,,	4/- to 8/-	—
e ,, ,, large ... ,,	8/6 to 17/6 & up	—
p Phosphor Bronze, plain castings ... ,,	1/1	—
p ,, ,, drawn bars & rods ,,	11d.	—
p ,, ,, rolled strip & sheet ,,	11d.	—
p ,, ,, wire ... ... ,,	1/-	¼d. dec.
o Platinum ... ... per oz.	£7 15s.	—
d Silicium Bronze Wire ... ... per lb.	8½d.	¼d. dec.
r Steel, magnet, in bars ... ... ,,	7½d.	—
n Tin, Block (English)... ... ... per ton	£223 10s. to £225 10s.	£1 dec.
g ,, Wire, Nos. 1 to 16 ... ... per lb.	3/5	—

Quotations supplied by :—

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta Percha and Telegraph Works Co., Ltd.
g James & Shakespeare.
h Edward Till & Co.
i Bolling & Lowe.
l Richard Johnson & Nephew, Ltd.
n P. Ormiston & Sons.
o Johnson Matthey & Co.
p C. Clifford & Sons, Ltd.
r W. R. Dennis & Co.

American Electrical Exports

An official return lately to hand indicates that the general industrial depression is continuing seriously to affect the overseas demand for American electrical machinery and apparatus. The exports of such material from the United States during the six months ended with June last attained a value of £3,472,930, as compared with £4,819,380 in the corresponding half of 1932, and £9,053,120 in the similar period of 1931.

School Lighting

The Leyton Education Committee's new school at Connaught Road, Leytonstone, has recently been completed and it has been equipped throughout with modern electric lighting fittings and lamps. In the assembly hall (shown in the accompanying illustration) special Siemens 16-in. diameter hexagonal ceiling fittings with cast brass frames, finished toned bronze, and rimpled glass panels are employed, each arranged to take three 60-W gasfilled lamps. The lighting of the classrooms has been carried out with Benjamin " Benflux " fittings and Siemens 100-W gasfilled lamps. The cable, conduit, fittings and lamps were supplied by Siemens Electric Lamps & Supplies, Ltd., the contractors for the work being Messrs. Harland & Wolff, Ltd.

Argentine Tariff Modifications

The *Board of Trade Journal* has published details of the alterations in the duties on British goods imported into Argentina effected by the recent Anglo-Argentine Trade Agreement. Little mention of electrical goods is made, but the following particulars of new duties (including the 10 per cent. *ad valorem* surcharge) may be of interest to our readers: Automobile ignition apparatus, &c., including sparking plugs, distributors, magnetos, switches, self starters and dynamos, horns, cable terminals and ammeters: 141 gold centavos per kg. Panels, main electrical distribution or circuit breaking, totally armoured or enclosed in boxes of cast-iron filled with insulating compound: from 300 to 500 kg., 20.16 gold centavos per kg.; from 500 to 1,000 kg.; 13.44 centavos; more than 1,000 kg., 10.08 centavos. Those weighing less than 300 kg. will continue to be classed as " electrical accessories in iron boxes," the duty on which is 25.2 centavos per kg. Electric motors and dynamos, in general, of more than ¼ h.p. weighing more than 500 kg., 7.2 centavos per kg. Insulated pipes or tubes of wrought or cast-iron, with or without accessories, varnished or not, 8.064 centavos per kg.

Lamp Publicity

We illustrate one of several examples of new display matter that has been prepared for all contractors and traders stocking " Relma " electric lamps. " Serjeant Socket " is the outstanding feature in the designs which Messrs. H. C. Rawson, Sheffield & London, Ltd., have adopted for advertising these lamps, which are made in London and stocked there, as well as at five important centres in other parts of the country.

" Relma " lamp publicity

New Municipal Showrooms

A new demonstration hall and offices for the Great Yarmouth Corporation Electricity Department at Electric House were formally inaugurated by the Mayor of Yarmouth on Monday, October 16th. During the remainder of the week the building was open for general inspection, and a special series of demonstrations and lectures were arranged relating to electric cooking, washing and lighting in the home.

New Catalogues and Lists

Klaxon, Ltd., 36, Blandford Street, W.1.—A leaflet describing the new grinding and polishing machine.

Neon Portable Units, Ltd., 85, Alsen Road, N.7.—A leaflet describing a neon portable (battery) unit.

Stanley Electrical Co., Latimer Works, Teddington.—A catalogue of time switches.

Sturtevant Engineering Co., Ltd., 147, Queen Victoria Street, E.C.—Publication No. 1374, dealing with air filtration and conditioning plant. The illustrations include photographs of works in which this plant has been installed.

Watson & Sons (Electro-Medical), Ltd., Sunic House, 43, Parker Street, Kingsway, W.C.2.—Illustrated twenty-page book-

let descriptive of surgical diathermy outfit and the advantages claimed for bloodless operation by the high-frequency electric arc method, with a separate price list sheet. Also an illustrated and priced leaflet dealing with the "Sunilux" combined mercury-vapour and heat therapy lamp.

C. A. Parsons & Co., Ltd., Heaton Works, Newcastle-on-Tyne.—Pamphlet No. 44, relating to "Imiplane" turbo-generating plants, and No. 35, describing surface condensers. Leaflets Nos. 45 and 46, entitled "Parsons Pole Mounting Transformers" and "Parsons Electrical Transformers."

Tangyes, Ltd., Cornwall Works, Birmingham.—Catalogue No. 486, giving particulars of the company's full range of generating and power equipment, and No. 487, fully illustrating and describing its latest garage equipment.

John Moores & Co., Ravald Street Works, Salford.—The 1934 catalogue of receiving sets, components and accessories.

An excellent display of "Magicoal Plus" electric fires at the Streatham showroom of the County of London Electric Supply Co., Ltd.

Rawlings Bros., Ltd., 95, Gloucester Road, South Kensington, S.W.7.—A copy of a poster illustrating the continuance of the "heat wave" in winter by installing electric heating.

David Brown & Sons (Hudd.), Ltd., Huddersfield.—A new catalogue containing full details of the stock spur drives, worm and bevel units, and gears of all kinds, produced by the company's subsidiary, the Keighley Gear Co.

Macintosh Cable Co., Ltd., Derby.—A fully illustrated and descriptive brochure of the Macintosh overhead distribution system for house services.

Siemens Electric Lamps & Supplies, Ltd., 38-39, Upper Thames Street, E.C.—Leaflet No. 535, dealing with all types of Association valves, and No. 667, giving particulars of "Full o' Power" radio batteries, with particular reference to class "B" amplification.

Birmingham Electric Furnaces, Ltd., Birlec Works, Tyburn Road, Erdington, Birmingham.—A business reply post card issued by the company requesting the supply of literature regarding "Birlec" electric furnaces.

Sun Electrical Co., Ltd., 118 and 120, Charing Cross Road, W.C.—An illustrated and priced folder (No. 596) of the new "Sunsphere" lighting fittings.

R. Roberts (Birmingham), Ltd., 53, Newton Street, Birmingham.—A leaflet containing illustrated particulars of a.c. valve rectifiers for the charging of car and wireless accumulators.

Power Machinery Trading Co., Southern Railway Sidings, Hampton, Middlesex.—A leaflet relating to cold-starting horizontal crude oil engines of from 25 to 124 h.p., together with a price list of "PM" cold-starting crude oil engines.

Bankruptcy Proceedings

J. H. McBean, trading as "The H.W.D. Battery Co.," 29, Bradford Road, Batley Carr, Yorks, electrical engineer.—The application for discharge herein was heard at the County Court, Dewsbury, on October 17th. It appeared that debtor had carried on three separate businesses, all of which had been unsuccessful. The judge granted the discharge subject to two years' suspension.

J. Golding, radio salesman, formerly radio dealer, 424, Upper Richmond Road, East Sheen, Surrey.—The first meeting of creditors was held on October 17th at 29, Russell Square, W.C.1, when a statement of affairs was submitted which disclosed liabilities of £1,154 and no assets. It was stated that in May, 1930, debtor commenced business on his own account under the style of the Clifford Radio Co., without capital. The business was successful until November, 1930, when debtor became involved in a legal action, and judgment was given against him later for £400 and costs. In March, 1932, he transferred the business to a limited company, of which he was appointed managing director. In March last he relinquished that appointment owing to a dispute. He attributed his failure to judgment given against him in the legal proceedings mentioned above, and differences with the limited company. The case being a summary one was left in the hands of the Official Receiver, as trustee.

E. Blackmore, 33, Monmouth Road, Dorchester, Dorset, electrician.—The public examination herein was held on October 10th at the County Hall, Dorchester. The statement of affairs lodged showed gross liabilities of £862, of which £344 was expected to rank for dividend. The net assets were £33, so that the deficiency amounted to £310. Debtor said his business premises comprised a workshop and stores. He had kept no books of account, and since 1920 he had borrowed £847. He was unable to give figures relating to the turnover of the business. The examination was closed.

J. O. Grant, electrical engineer, 63, Queen Victoria Street, E.C., and Strathspey Park Road, Shenfield.—The statutory first meeting of creditors was held on October 23rd at London Bankruptcy Buildings. The receiving order was made on October 10th upon the petition of the executors of the late Mrs. Bertha Ross. According to the debtor's statements in his preliminary examination he carried on business for twenty-five years as an electrical engineer in Queen Victoria Street in partnership under the style of "J. O. Grant & Taylor." He retired from the partnership last December, Mrs. Taylor taking over the liabilities and assets and continuing the business. The debtor added that his bankruptcy was caused by the claim of the petitioning creditors, which claim he did not admit. Some years ago Mrs. Ross lent him £500 and later agreed to forgo the debt if he paid her £25 a year as interest so long as she lived. The interest was paid regularly until the death of Mrs. Ross. Subsequently the executors brought an action to recover payment of the £500, and although he was advised that he had a good defence, he was unable, through lack of funds, to defend the action. The only debt was £525 claimed by the petitioners and the assets being returned at £7 the case was left in the hands of the Official Receiver to be administered in bankruptcy.

E. H. Jones, electrician and radio dealer, Northcote Buildings, Undercliffe, Bradford.—Receiving order made October 5th on debtor's own petition. First meeting held October 20th. Public examination, November 3rd, at the County Court, Bradford.

F. W. Westover, wireless dealer, 20, Woodbury Park Road, Tunbridge Wells.—Receiving order made October 10th on debtor's own petition.

H. L. McIvor, electrical engineer, 92, High Street, Ewell.—First and final dividend of 8¼d. in the £, payable October 25th at 29, Russell Square, W.C.

R. S. Wright, 33, Broomfield Road, Coventry, wireless dealer.—The public examination herein was held recently, at the County Hall, Coventry, when the statement of affairs showed liabilities of £511 and a deficiency of £471. Debtor stated that he had suffered through competition. The examination was closed.

J. F. Creasey (Positive Electric Co.), electrical engineer, 673, Romford Road, Manor Park, E., and at Wanstead Park and East Ham.—Receiving order made October 12th on a creditor's petition. First meeting yesterday (Thursday), and public examination December 6th, both at Bankruptcy Buildings, Carey Street, W.C.

H. H. Bucklar, electrical engineer, 3, The Arcade, Hitchin.—Last day for receiving proofs for dividend, November 1st. Trustee, Mr. P. F. Keens, 11, George Street West, Luton.

F. M. Clarke, electrical engineer, 3, Joyce Avenue, Sherwood, Nottingham.—Last day for receiving proofs for dividend November 4th. Trustee, Mr. L. A. West, 22, Regent Street, Nottingham, Official Receiver.

S. Purcell, electrical contractor, The Arcade, Goole.—Application for discharge to be heard December 5th at the Court House, Wakefield.

Company Liquidations

J. Cameron & Co. (Leeds), Ltd.—At a recent meeting of creditors it was reported that the liabilities were £254, all due to unsecured creditors. The total assets of £25 were insufficient to meet claims of preferential creditors totalling £49. The company was incorporated in September, 1932, taking over an existing business. The nominal capital was £1,000, of which £710 had been issued and was fully paid. The vendor was allotted fully-paid shares to the value of £510 as the consideration of the assets transferred to the company, and a further £200 was subscribed in cash. The turnover from the date of the formation of the company down to June last was £531, and there was a net loss of rather more than £500.

Imperial Light, Ltd.—Winding up voluntarily. Liquidator, Mr. N. M. Shaw, Victoria Station House, Victoria Street, S.W. Particulars of claims to the liquidator by November 1st.

Erith Battery Co., Ltd.—Winding up voluntarily. Liquidator, Mr. L. G. Percival, Markham, Oaklands Avenue, West Wickham.

Electric Sales, Ltd.—Particulars of claims by December 2nd to the liquidator, Mr. K. F. Steven, 3, Throgmorton Avenue, E.C.

Northern Wireless Relay Co., Ltd.—Winding up voluntarily, for reconstruction purposes.

Electric Lamp Factors, Ltd.—Particulars of claims by November 18th to Sir William H. Peat and Mr. L. Civval, 11, Ironmonger Lane, E.C., joint liquidators.

Paris & Partners (Engineers), Ltd.—Particulars of claims by October 31st to the liquidator, Mr. E. H. Hawkins, 4, Charterhouse Square, E.C.

International Electric Co., Ltd.—Meetings November 27th at 11a, Hart Street, W.C., to receive an account of the winding-up by the liquidator, Mr. J. J. Ure.

Wark & District Electric Lighting Co., Ltd.—Meetings November 21st at National Provincial Bank Chambers, Hexham, to receive an account of the winding-up by the liquidator, Mr. W. Patterson.

Private Arrangement

W. W. Wright (trading as Wright & Craven), electrical contractor, 192, Hunslet Road, Leeds.—At a recent meeting of creditors the statement of affairs showed liabilities of £882, of which £590 was due to the trade. There were also fully secured creditors for £96. The assets totalled £652, and after allowing £79 for preferential claims, the net assets were £573, leaving a deficiency of £308. Owing to proceedings having been commenced a deed of assignment had already been executed to Mr. T. A. Stoker, 71, Albion Street, Leeds. A resolution was passed confirming this deed, and a committee was also appointed.

Dissolution of Partnership

D. L. & R. Cooper, electrical factors, 66, Framingham Road, Brooklands.—Messrs. R. Cooper and D. L. Cooper have dissolved partnership. Mr. R. Cooper will attend to debts.

Electricity Supply

Lighting, Domestic, Power

Bexhill.—Time Switches for Street Lamps.—The Corporation Electricity Committee has approved the installation of automatic time switches to the majority of street lamps. The estimated annual saving is £149 per annum. The Committee recommends that application be made for sanction to a loan of £2,258 for the purpose.

Reduced Charges.—The Electricity Committee, after considering the engineer's report on the question of a special rate for off-peak supplies for water heating, recommends the adoption of a charge of ¼d. per kWh for this purpose, current not to be available between the hours of 4.30 p.m. and 8.30 p.m. A rental of 10s. 6d. per annum is proposed for the time-switch and additional meter.

Loan.—Application is being made for sanction to a loan of £2,000 for meters.

Supply to Hooe.—As the result of a further canvass which has been carried out, the Weald Electricity Supply Co., Ltd., has decided to proceed with the supply to Hooe.

Bingley.—Bulk Supply.—The Urban District Council has for some months past been conferring with the Keighley Corporation with regard to a further agreement for a period of years for bulk supply. It has also had an offer from the Yorkshire Electric Power Co., and the Council has finally decided to terminate the agreement with the Keighley Corporation and to take a supply from the Yorkshire Power Co., as from April 1st, 1934.

Blackpool.—Switchboard Extensions.—The Electricity Committee has authorised switchboard extensions at a cost of £2,000.

Blaydon-on-Tyne.—Supply at Winlaton Mill.—The Urban District Council has approved plans submitted by the North-Eastern Electric Supply Co., Ltd., for overhead and underground lines to be erected at Winlaton Mill.

Bradford.—Extensions.—The Electricity Committee is to provide a sub-station and extend mains at Clayton at a cost of £2,023.

Brighton.—Neon Sign Regulations.—The Corporation Electricity Committee has approved a set of regulations proposed by Mr. W. N. C. Clinch, the borough electrical engineer, relating to the erection of neon signs. Briefly, they provide that the engineer shall approve the position, projection and size of the illuminations; the backgrounds must be of hard wood or metal, and no soft wood will be permitted; double-pole switches, protected by double-pole main fuses, the switches to be "on" position upwards, and appropriate wiring must be fitted; and in all cases where the current consumed is over 230 VA the power factor must be corrected to 0.8, except in the case of helium, where 0.75 will be accepted.

Extens'ons.—Mains are to be extended at an estimated cost of about £330.

Burton-on-Trent.—Sub-station.—The Electricity Committee is to erect a sub-station in Woodview Road, Stanton.

Extensions.—The Electricity Committee is to extend mains at a cost of £2,500 to afford an electricity supply to Rangemore.

Canada.—Development in Quebec.—As a result of a greatly increased demand for power, the Shawinigan Water & Power Co., of Montreal, is resuming development of its plant at Rapid Blanc, on the St. Maurice River, in the province of Quebec, work on which was suspended in 1932 owing to economic conditions. Operations will proceed during the winter months, with a view to bringing the capacity up to 80,000 h.p. by May 1st of next year, reports our Toronto correspondent. This will later be increased to 160,000 h.p. The programme of development being undertaken at present will cost $1,500,000.

Electricity Output.—Electrical energy produced in Canada in August showed an increase of 11.5 per cent. over the July output, according to the Dominion Bureau of Statistics. August was the fourth successive month to show an increase in production, and a larger proportion of the August output was consumed in Canada. Export of electrical energy to the United States during the month was 112,322,000 kWh, as compared with 119,192,000 kWh during July.

Carlisle.—Loan.—The City Council is applying for sanction to a loan of £15,000 for mains and services.

Mains Extensions.—The Electricity Committee is to extend mains at an estimated cost of £1,524.

Chelmsford.—Sub-station.—The Corporation has granted permission to the Electric Supply Corporation, Ltd., to erect a sub-station at Longstomps reservoir.

Colchester.—Hire-purchased Irons.—The Electricity Committee recommends a quarterly charge of 1s. to any consumer desirous of acquiring an electric iron on the hire-purchase system, the iron to become the consumer's property after sixteen payments.

Extensions.—The Electricity Committee proposes to proceed with the provision of electricity supply to Wormingford and district at a cost of £2,748.

Croydon.—Loan.—The Electricity Committee has obtained sanction to borrow £21,759 for mains and £13,045 for plant.

Sodium Lamps.—The Electricity Committee recommends an agreement with Messrs. Philips Lamps, Ltd., for the maintenance of the new sodium lighting (60 lamps) of part of Purley Way. The total cost of the installation (including cable work) is £1,552, and the estimated annual cost of the 60 lamps (maintenance and energy) is £337 as compared with £273 for the same number of the usual type of lamp.

Douglas (I.O.M.).—Hire of Domestic Apparatus.—Mr. J. P. Tucker, engineer and secretary of the Isle of Man Electricity Board, has sent us details of a new scheme for the hiring out of domestic apparatus. The following charges are to be made:—Small cooker (2-4 persons), 7s. 6d. per quarter; medium size cooker (5-7 persons), 9s.; larger cookers, 10s. 6d.; 2 kW electric fire, 1s. 6d.; electric bowl fire, 1s. Electric cookers are to be wired up free of cost if within 15 ft. of the meter, wiring in excess being charged at the rate of 1s. 6d. per foot.

Ealing.—Hire and Hire-purchase Terms.—The Electricity Committee recommends that electric water heaters of the following sizes be made available to consumers on hire and hire-purchase terms, and that the following scales of charges be adopted: Simple hire—2-gallon size, 3s. per quarter; 5-gallon, 5s.; 12-gallon, 6s.; 15-gallon, 7s. 6d.; 20-gallon, 9s.; and 30-gallon, 10s. Minimum period of hire, three years. Hire-purchase: 20 per cent. of list prices to be paid on application and the balance by four equal quarterly instalments; a flat rate of ¾d. per kWh will be charged to all consumers who take a supply of electricity for the combined purposes of heating, cooking, and water-heating.

Eastbourne.—Loan.—The Electricity Committee is seeking permission to borrow £5,000 for the purchase of cookers.

East Ham.—Cooker Hiring Rates.—The engineer and manager has reported upon the results of the scheme instituted for the hire of cookers and supply of electricity at an inclusive rate of 1d. per kWh, and the Committee has recommended that the scheme be continued up to the end of the current financial year, and with a limit of a further 500 cookers, upon the following terms: (1) That upon payment of 5s. an electric cooker shall be installed complete with wiring not exceeding 30-ft. run; (2) that the hire of cooker and the supply of electricity for the cooker, lighting and all other domestic purposes be covered by an inclusive charge of 1d. per kWh; (3) that quarterly accounts be rendered, subject to a discount of 5 per cent. for payment of account within fourteen days; (4) that a minimum number of 360 kWh be paid for each quarter (equivalent to £1 10s., less 5 per cent.—£1 8s. 6d. net); (5) that existing consumers be allowed to transfer to this scheme.

Loan.—The Electricity Committee recommends application for a loan of £50,000 for rental wiring schemes.

Eccles.—Mains Extension.—The Electricity Committee is to extend mains at a cost of £455.

Exeter.—Loan.—The Electricity Committee is to seek permission to borrow £5,000 for the provision of house-wiring installations.

Glasgow.—Reduced Charges.—The Clyde Valley Electrical Power Co., Ltd., has informed the Corporation that it is to reduce the charge for electricity for public lighting from 1d. to ¾d. per kWh as from October 1st.

Hire Charges Reduced.—Greatly reduced charges for installation and hire of British National "Deluxe" electric cookers are now made available by the Clyde Valley Electrical Power Co. The installation charge, which was previously £2 10s., is now reduced to £1. An electric kettle is supplied with the cooker without charge.

Extensions.—The Electricity Committee has recommended that distributing mains be laid at a cost of £1,108.

Grantham.—Reduced Charges.—The Urban Electric Supply Co., Ltd., has reduced the secondary charge of 1½d. per kWh under the two-part tariff to 1d. per kWh, and as an alternative to the flat rate for power there is a two-part tariff, as follows: First 10 kW of maximum demand, £10 per kW per annum, and beyond, £7 per annum, with the following "unit" charges: First 3,000 kWh per quarter, 1d. per kWh; beyond, 0.75d.

Great Yarmouth.—Loan Sanctioned.—The Electricity Committee has received sanction to borrow £5,989 for the installation of new transformer plant at the electricity works, and £2,447 for feeder extensions from Ferry Hill to Hopton.

Hastings.—Extensions.—The Electricity Committee is to provide a supply of electricity to Marley Lane, Battle, at a cost of £720, and proposes to borrow £25,000 for mains extensions.

Supply to Guestling.—The Rural District Council has approved an amended plan of overhead lines for a supply of electricity at Rocks Lane, Guestling.

Hull.—Prepayment Meters.—The electrical engineer has been authorised to introduce a system of prepayment meters which will include the standing charge under the domestic tariff and also the cooker rentals.

Ilford.—Sub-station.—The Electricity Committee has purchased a site in Primrose Avenue for the erection of a sub-station.

India.—Electricity in Rajpipla.—Our Bombay Correspondent states that surveys have been made for hydro-electric schemes in the Rajpipla State in the Bombay Presidency for agricultural and electric-power purposes, both on the river Nerbudah at four different sites and on the river

Karjan. The prospects for both schemes are considered to be favourable, but the financing has still to be settled.

Isle of Man.—OVERHEAD DISTRIBUTION.—Work is in progress on the completion of the overhead systems of distribution in the Isle of Man. The extension of the 33,000-V line from Peel to Kirk Michael has been completed, though the link between Ramsey and Kirk Michael and that between St. Johns and Arbory have yet to be made.

Italy.—HYDRO-ELECTRIC DEVELOPMENT.—In a recent issue of *L'Elettrotecnica* Signor Mortara gives a lengthy description of the Calusia hydro-electric power station, which has lately been completed to utilise the power of the third fall on the River Neto. The new station is directly supplied by the water utilised at the Timpa Grande plant higher up the river, this being supplemented by water taken from the Neto. The plant at Calusia, which works under a head of about 475 ft., comprises two Francis-type horizontal-shaft turbines coupled direct to 17,600-kW 10,000-V three-phase generators. The station is semi-automatically controlled from the Timpa Grande plant. For transmission purposes the power is stepped-up to 65,000 V by a 22,000-kVA transformer.

Kettering.—ELECTRIC STREET LIGHTING.—The U.D.C. has decided upon central electric street lighting in London Road and Bowling Green Road at a cost of £400.

London.—BATTERSEA.—The Electricity Committee is to install electricity services in 201 premises at an estimated cost of £1,785.

ST. MARYLEBONE.—The Electricity Committee is to install rising mains for 1931 flats at Rosmore Court at a cost of £385.

The Electricity Committee has stated in a report that to meet the requirements of the L.C.C. in connection with the provision of testing stations on the l.p. a.c. system, arrangements have been made to provide such facilities in various transformer sub-stations, and for the installation therein of recording voltmeters. In the model flats proposed to be erected by the Housing Association on the Wilcove Place site, provision is made for electric cookers and each flat is provided with electric water heaters. A few of the flats are "all-electric."

ST. PANCRAS.—The Electricity Committee is to provide a sub-station on the Leighton Road Housing Estate at a cost of £1,076, and to extend mains at a cost of £850.

SHOREDITCH.—The Electricity Committee is applying for sanction to borrow £15,000 for mains and services, £15,000 for meters and £10,000 for the provision of installations for consumers under the "free wiring" scheme.

Lowestoft.—BULK SUPPLY CHARGES.—The Great Yarmouth Corporation has agreed to reduce the bulk supply charge to Lowestoft from £3 10s. per kVA to £3 7s. 6d., and the question of a further revision will be considered when Great Yarmouth takes a supply from the Central Electricity Board.

Northern Ireland.—BELFAST.—At a meeting of the Corporation Electricity Committee the city electrical engineer reported that a new loan would be necessary to meet the expense of extending the mains and miscellaneous plant to satisfy increased demands for supply, which preliminary applications indicate, during the next two years, ending March 31st, 1935. The Committee decided to recommend, subject to the approval of the Finance Committee, that application be made for sanction to raise a loan of £130,000 to meet the necessary expenditure.

Oban.—EXTENSION.—The extension to the power station was declared open last October by Provost Macalister. Mr. W. D. Saddington, borough electrical engineer, stated that the two new 450 h.p. engines were installed chiefly owing to the increasing demand for electric heaters and cookers. Messrs. Callender's Cable and Construction Co., Ltd., had charge of the operations connected with the extension.

Pudsey (Yorks).—REVISED CHARGES.—The Town Council has approved a new scale of charges involving an increase in the minimum charge from 6s. 9d. to 11s. 2d. per quarter, with reductions in the "unit" charge for combined house and shop properties, domestic heating and power, theatres and cinemas, and in respect of increased consumption generally over 120 kWh per quarter.

Redcar.—LOAN.—The Town Council is contemplating extending its electricity undertaking and is making application for sanction to borrow £4,500 for the introduction of a hiring system.

Rotherham.—REVISED CHARGES.—The Town Council has adopted a revised scale of charges. The heating rate for houses, shops, offices and works is now ¼d. per kWh, without any standing charge, and irrespective of quantity consumed. The domestic rate has been reduced to ¼d. per kWh, and in the case of premises used for combined domestic and business or professional purposes the quarterly payment, based on the rateable value, has been reduced to 2½ per cent. The minimum quarterly rateable value payment has been lowered to 6s. 6d. At an early date it is proposed to offer low hire-purchase terms to all consumers who already have electric cookers and fires on simple hire.

Sleaford.—HIRE OF APPARATUS.—The Electricity Committee has decided that electric cookers only shall be let out on hire, but that consumers may have the choice of type.

South Africa.—SWITCHGEAR FOR JOHANNESBURG.—It is proposed to purchase h.p. switchgear and accessories for the City Council at a cost of £6,900. This is in connection with the partial supply of the Victoria Falls and Transvaal Power Co. to meet the demands for next winter, as the new 10,000-kW turbo-generator will not be ready until the 1934 winter season is over.

OUDTSHOORN SCHEME.—The Oudtshoorn ratepayers have sanctioned the raising of a loan of £31,000 for alterations in the electricity supply system. The present power station will be abandoned and a new one erected on another site. The supply will be changed over from d.c. to a.c.

South Shields.—REDUCED CHARGES.—The Electricity Committee has agreed to reduce the charge for domestic heating and power from 1d. to ¾d. per kWh from the January meter readings.

Southend-on-Sea.—MAINS EXTENSIONS.—The Town Council has sanctioned mains extensions in the borough at an estimated cost of £5,334.

Sunderland.—CONVERTING PLANT.—The Town Council has agreed to purchase new converting plant to be installed in the Dunning Street sub-station at a cost of £5,000.

Switzerland.—ELECTRICITY SUPPLY PROGRESS.—A movement is proceeding in Switzerland to promote the consumption of electricity and the export of electrical manufactures, and

H.H. the Pope at the opening of the new generating station for the Vatican City, which he recently inaugurated

at the same time restrict the imports of pit coal. In connection with the unfavourable trading balance of the country the Federal Council is adopting various measures to bring about a change, and in electricity supply circles these measures are attributed for the most part to the imports of coal. At the end of 1932 the total output capacity available for the production of electricity was recorded at 2,560,000 h.p., distributed over 6,021 plants, of which only 366 supplied energy to third parties, the remainder being private installations at different works and other establishments, &c. The output capacity of the hydro-electric works in the year 1931-32, according to information from Berne, amounted to 4,988,000,000 kWh, but the actual production was 3,567,000,000 kWh, so that the capacity was utilised only to the extent of 71.5 per cent. Besides these works, the steam power stations produced 30,000,000 kWh in the same financial year, while 11,000,000 kWh was imported. If other countries are disposed to purchase more electrical manufactures from Switzerland the latter country, in return, will not reduce her imports of coal from them to the same extent as now proposed, namely, to one-third of the import tonnage in 1931.

Todmorden.—LOANS.—The Electricity Committee is seeking sanction to borrow £250 for mains in connection with the change of system of supply and £3,000 for transformers and switchgear.

Wellington (Somerset).—EXTENSIONS.—The Rural District Council has sanctioned the erection of overhead lines by the Wellington District Electricity Co., Ltd., in the parish of Wiveliscombe Without, from the Northgate housing estate to Langley and Langley Marsh.

Western Australia.—YEAR'S WORKING.—The report of the State electricity undertaking shows that there was a total revenue of £278,869 and working expenses of £191,654 for the year ended June 30th, as compared with £272,214 and £192,867, respectively, for the previous year. The net profit increased from £17,871 to £25,440, and the amount sold from 68,167,868 kWh to 74,865,384 kWh.

Worthing.—TERMS FOR ALL-ELECTRIC HOUSES.—The Electricity Committee has decided that terms be extended to all all-electric houses, as follows: Not more than one fireplace for a coal fire to be provided in each house; all domestic requirements for lighting, heating, and power (such as room lighting and heating, hot-water supplies, clothes washing, ironing, vacuum cleaning, and cooking) to be carried out by electricity and no other system to be introduced for these purposes; the prices for electricity to be: Fixed annual charge for houses not exceeding 1,100 sq. ft. of floor area, £7 15s., and for houses exceeding 1,100 sq. ft. of floor area such additional sum as the engineer shall determine, plus ¼d. per kWh consumed; period of agreement, one year, and thereafter subject to three months' notice.

Traction

Brighton.—TRACK RENEWAL.—The Tramways Committee has authorised the engineer to place on order the necessary material for renewing the track in London Road in the early spring.

CHEAPER CURRENT.—The Electricity Committee has decided to reduce the cost of current for traction purposes from 1d. to 0.8d. per kWh as from April 1st last.

Czechoslovakia.—PRAGUE.—A trolley-bus system is to be introduced into the city next year.

London Transport.—TRAMWAY ABANDONMENT.—East Ham Corporation reports that the London Passenger Transport Board proposes to abandon the tramway in Nelson Street.

ANOTHER "UNDERGROUND" EXTENSION.—The service of "Underground" trains (Piccadilly Line) will be extended from South Harrow to Uxbridge at the western end on Monday. The through service from Uxbridge to Cockfosters will replace the existing shuttle service between Uxbridge and South Harrow.

TRAM AND TROLLEY-BUS EXTENSIONS.—The London Passenger Transport Board is considering the possibility of substituting trolley-buses for trams between Penge and Sutton, and extending to West Croydon the tram service from Tooting Junction to Mitcham Cricket Green.

New Zealand.—RAILWAY ELECTRIFICATION.—The electrification of the Wellington-Paekakariki main railway line has now been commenced, and work is being carried out by the pole-erecting gangs on the job, says the *New Zealand Electrical Journal*. New Zealand, especially the North Island, with its steep grades, lends itself to electrification with considerable economy.

Rotherham.—TROLLEY-VEHICLE *v.* PETROL-BUS.—A test took place recently between a trolley-bus and a six-cylinder petrol-bus on a route with frequent stops. The trolley-bus won with ease, its outstanding advantage being its superior acceleration.

Danish telephone engineers at the G.P.O., London

Seated (from left to right): Mr. M. Seebsager, Mr. C. Michelsen, Sir Kingsley Wood (Postmaster-General), Mr. G. Irming and Mr. P. V. Christensen. Standing: Lt.-Col. A. G Lee (Engineer-in-Chief, G.P.O.) and Sir Edward Campbell (Parliamentary Secretary to the P.M.G.).

St. Helens.—MORE TROLLEY-BUSES.—Application is to be made by the Corporation for powers to operate trolley-vehicles on an extension of the Dentons Green route to Eccleston, and a connecting route between the Dentons Green and Moss Bank routes.

Southampton.—TROLLEY-BUSES.—The Corporation is considering the possibility of substituting trolley-buses for its trams.

Swansea.—FISH STOP TRAMS.—The fact that fish from the docks entered the condenser tubes at the electricity works caused the stoppage of the tramway service recently. The tubes contained many kinds of fish, including eels and crabs.

Traffic Signals.—The Great Yarmouth Corporation is to install traffic signals at six points at an estimated cost of £410 each, and the Bournemouth Corporation is to install lights at Lansdowne (£890).

Warrington.—CHEAPER ELECTRICITY FOR TRAMS.—The Electricity Committee has reduced the charge for current to the Tramways Department from 1d. to 0.8d. per kWh.

Western Australia.—YEAR'S WORKING.—There was a total revenue of £281,500 and working expenses of £226,260 for the year ended June 30th, as compared with £285,950 and £224,349 respectively in the previous year. The net profit decreased from £9,342 to £3,201, and the car mileage from 3,356,444 to 3,346,895, while the number of passengers carried decreased from 29,504,119 to 29,401,426.

Communications

Australia.—LISTENERS' FEES.—The Australian Postmaster-General has indicated that a reduction in the present fee of 24s. for broadcast listeners' licences will be favourably considered when the payment of 3s. on each fee as a royalty on patents used in broadcasting expires on March 1st. The amount thus saved will be about £75,000 a year.

Holland.—NEW WAVELENGTH.—The Hilversum broadcasting station is to change its wavelength from 296.2 to 301.5 metres. Huizen, the Dutch long-wave station, will remain on 1,875 metres.—*Reuter*

India.—TELEPHONE EXTENSIONS.—India is being linked to Ceylon through Madras, including thirty miles of cable, from Ramesbwaram (the southernmost point of India) to the coast of Ceylon. It is proposed to institute a wireless telephone service between Rangoon and Madras. Karachi is to be brought into direct touch with Bombay, *via* Ajmer and Hyderabad. This will make it possible to converse *via* Ratlam, instead of the circuitous route *via* Delhi and Lahore as hitherto. The linking of Quetta and Sukkar, which is connected with Karachi and Lahore, will bring the hill station nearer. Madras and Calcutta are to be linked, and the new harbour of Vizagapatam, meant to feed central India, is to be joined to Nagpur *via* Dongre Ghar and Rai Ghar. Bangalore (Mysore) is to be linked to Madras, while the old port of Mangalore, which cannot be connected with Bombay directly owing to the very hilly nature of the country, is to obtain a place in the trunk system after it is linked to Calicut farther down the coast. Jubbulpore is to be linked to Allahabad in the trunk system. On the Calcutta-Bombay line a "three-channel" carrier mode will be employed.

The telephone service between Great Britain and India, which has hitherto been restricted to Bombay, Madras, Calcutta, and certain other towns, has now been extended to Delhi and Simla.

BROADCASTING IN THE N.W. FRONTIER PROVINCE.—A modest scheme for broadcasting is being considered by the Government of the North-West Frontier Province. It is proposed to install receivers in ten selected villages on the frontier, to which a daily programme will be transmitted with the help of the local post and telegraph station. If the experiment is successful the scheme will be extended to other villages.

Iraq.—TELEPHONY.—Communication between Damascus and Baghdad is expected to be inaugurated early in November, thus linking Iraq, Palestine, Syria, and Egypt telephonically.

London.—TELEGRAPH AND TELEPHONE RESULTS.—The Postmaster-General announces that for the first time in ten years the decline in telegraph traffic was arrested in August this year. The number of telephone subscribers continues to increase, and a satisfactory feature is the decrease in the number of telephones given up on account of the trade depression. In about a week's time the "on demand" service will be introduced between London and certain cities abroad, including Paris, Berlin, Rome, and Vienna.

Netherlands.—CABLE BREAK.—The Postmaster-General announced last week-end that a break had occurred in one of the principal submarine telephone cables between England and the Netherlands. Until a cable ship had effected repairs it was feared that some delay might occur at times in establishing calls over alternative routes to the Netherlands, Scandinavia, and Northern Germany.

Poland.—PUNISHING RADIO "PIRATES."—New regulations issued by the Ministry of Posts, Telegraphs, and Telephones make illegal users of receiving sets liable to be sentenced to three months' imprisonment, fined up to 3,000 zlotys (about £70), ordered to surrender their sets, and pay the Post Office six times the monthly fee of 18 zlotys.

South Africa.—AUTOMATIC TELEPHONY.—The Durban Town Council has accepted the offer of the Union Government to purchase, on its behalf, the automatic telephone equipment which will be used to convert the present manual exchanges, at a cost of £75,000. This is the result of the agreement whereby the Corporation undertook to co-ordinate its telephone installation, the only privately owned system in the Union, with the State system. The total value of the plant required is about £108,000. Automatic telephones are now being installed in many parts of South Africa, the Strowger line-finder system being used, which is manufactured by the Automatic Electric Co., of Liverpool. The British Post Office acts as consultant for the Union Postal Department in matters of telephone equipment.

Switzerland.—RADIO STATION POWER.—The power of the Schweizerischer Landessender is to be increased to 100 kW. and the Radio-Suisse Romande transmitter is to use 50 kW.

Contract Information

When "Contracts Open" are advertised in our "Official Notice" pages the date of the "Electrical Review" containing the advertisement is given in parentheses below

Contracts Open

Australia.—MELBOURNE.—Post and Telegraph Department. December 5th. Microphones. (A.Y. 12030.)*
December 19th. Telephone dial parts. (A.Y. 12031.)*
December 12th. Telephone parts and accessories. (A.Y. 12032.)* Telephone indicators. (A.Y. 12033.)*
November 28th. Lead-sheathed switchboard cables. (A.Y. 12002.)*
November 21st. Telephone terminal strips. (A.Y. 11996.)*
November 14th. Ringing dynamotors. (A.Y. 11984.)* Telephone ringers. (A.Y. 11986.)* Submarine telephone cable. (A.Y. 11973.)*
December 5th. Telephone switchboard cable. (A.Y. 12015.)*
December 12th. Multiple twin telephone cables. (A.Y. 12016.)*
December 19th. Vitreous resistances. (A.Y. 12042.)*
State Electricity Commission of Victoria. December 4th. 22,000-V switchgear and accessories, comprising oil circuit breaker equipments with current transformers. (A.Y. 12014.)*

Bridgend.—November 10th. Electricity Department. Stores for six months, including cables, meters, time switches, cookers, washboilers, &c. (See this issue.)

Egypt.—CAIRO.—November 14th. Ministry of the Interior. Pumps, electric motors, boilers, &c. (G.Y. 12912.)*
November 30th. Six 50-kVA transformers. (A.Y. 12013.)*

Glasgow.—November 1st. Corporation. Various works, including electric lighting, refrigerating plant, &c., at central police mortuary. Schedules, &c., from Master of Works, City Chambers (Room 81), (£2 2s.). Tenders to Town Clerk.

Grimsby.—November 10th. Electricity Department. L.p. cables. (See this issue.)

India.—NEW DELHI.—December 4th. Indian Stores Department. 220/230-V, single-phase, 50-cycle ceiling fans. (A.Y. 11959.)*
December 11th. D.c. ceiling fans. (A.Y. 11965.)*
January 8th. A.c. and d.c. table fans. (A.Y. 11967.)*
November 14th. Single-core flameproof v.i.r. insulated cable. (A.Y. 12010.)
November 28th. Cotton and silk-covered wire. (A.Y. 12044.)*

London.—SOUTHWARK.—November 1st. Borough Council. Electric cables for twelve months ending November 30th, 1934. (September 29th.)
ISLINGTON.—November 17th. Electricity and Lighting Committee. Supply of materials and labour for laying distributor cables and earthenware pipes. (See this issue.)

Manchester.—October 30th. Electricity Department. Immersion water heaters and storage-type electric water heaters (twelve months' supply). (October 13th.)

New Zealand.—WELLINGTON.—Posts and Telegraph Department. December 5th. 2,400 lb. of cored solder. (G.Y. 13046.)*
January 16th, 1934. Public Works Department. Four 1,500-kVA transformers. (A.Y. 12017.)*
January 8th. Microtelephone cradles. (A.Y. 12046.)* Telephone jacks. (A.Y. 12045.)*
January 9th. A 100-Ah secondary battery with 60 cells. (A.Y. 12047.)*

Northern Ireland.—LURGAN.—October 31st. Installation of electric lighting and power at the Infirmary. Clerk of Union (deposit £5 5s.).

Renfrew.—October 31st. County Council. Joint Committee for Maternity Service. Electric lighting and heating installation at maternity hospital, Johnstone. Mr. J. C. Fraser, Clerk to the Committee, County Buildings, Paisley.

South Africa.—JOHANNESBURG.—City Council. November 4th. Ten 50-h.p. tramcar motors. (A.Y. 12001.) Tramway traction recorder. (A.Y. 12003.)*
KROONSTAD.—December 4th. Municipal Council. Machinery and plant for a power station. (A.Y. 12004.)* Steam raising plant. (G.Y. 13038.)* Motors, meters, cable, transformers, conductors, kiosks and sundries. (A.Y. 12029.)*
CAPE TOWN.—November 29th. Electricity Department. Fifty automatic street-lighting controllers. (A.Y. 11994.)*
November 1st. House service meters. (A.Y. 12000.)*
November 15th. L.p. ironclad switchgear. (A.Y. 12040.)*
November 18th. Electricity Supply Commission. One 1,500-kVA station oil-immersed transformer. (A.Y. 12041.)*

Uruguay.—MONTEVIDEO.—November 30th. State Electricity Supply and Telephones Administration. 101,400 metres of lead-covered conductors. (A.Y. 12012.)*
November 29th. 233,000 metres of insulated conductors for outdoor use. (A.Y. 12011.)*
November 9th. Ministry of Public Works. Machinery and accessories for pumping stations. (G.Y. 13074.)*

Walsall.—November 7th. Electricity Department. L.p. cables. (October 20th.)

Wembley.—November 8th. Urban District Council. Carcase wiring, &c., of 150 cottages. (October 20th.)

* Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Contracts Closed

Bexhill.—Highways Committee. Recommended. Traffic signals at Sackville Road (£312).—Siemens & General Electric Railway Signal Co., Ltd.

Croydon.—Electricity Committee. Recommended. Motor-driven circulating water pump (£1,059).—Mather & Platt, Ltd.

Eastbourne.—Electricity Committee. Recommended. Supply for rural areas. Transformers (£752).—Electric Construction Co., Ltd. Switchgear (£178).—Ferguson, Pailin, Ltd. Pillars, &c. (£115).—Lucy & Co.

Government Contracts.—The following contracts were placed by the various Government Departments during September:—

ADMIRALTY (CONTRACT AND PURCHASE DEPARTMENT).

Batteries.—Edison Swan Co.
Blowers, rotary and high-pressure air compressors, &c.—Reavell & Co. Sub-contractors for electrical gear.—Laurence, Scott & Electromotors.
Coils.—Radio Instruments, Ltd.
Ebonite containers.—I.R. G.P. & Telegraph Works Co.
Electrodes.—Quasi-Arc Co.
Motor generators (low power).—G.E.C. Sub-contractors: Electrical Apparatus Co. for motor starters; Cox Walker & Partners for voltage regulators.
Switches, &c.—Wm. McGeoch & Co.; Engineering & Lighting Equipment Co.
Switchboards (low power).—Whipp & Bourne.
Valves, control and indicator gear.—Brown Bros.
Electric winches.—Cowans, Sheldon & Co.

WAR OFFICE.

L.t., &c., cable.—Standard Telephones & Cables.
W/t. sets and parts.—H. W. Sullivan.

AIR MINISTRY.

Accumulators.—Batteries, Ltd.
W/t. valves.—G.E.C.

POST OFFICE.

Telephonic apparatus.—Automatic Electric Co.; British Metal Engraving Co.; Ericsson Telephones; G.E.C.; Gent & Co.; B. W. Johnson & Sons; Phœnix Telephone & Elec. Works; Siemens Bros.; Telephone Mfg. Co.
Testing and protective apparatus.—S. Smith & Sons (Motor Accessories).
Cable.—Connollys (Blackley); W. T. Glover & Co.; Henley's; Siemens Bros.; Standard Telephones; United Telephone Cables.
Electric lighting fittings.—Revo Electric Co.
Motor generators.—Small Electric Motors.
Wallboards.—Standard Telephones.
Electric lifts.—Cambridge P.O. and telephone exchange: Evans Lifts. Liverpool, Hatton Garden parcel sorting office: Pickerings.
Telephone exchange equipment.—Prospect (London), Leytonstone (London), Midland (Birmingham), Glasgow (Central): G.E.C. Cherry Hinton (Cambridge), City (London), Acorn (London), London Directory Enquiry Bureau: Standard Telephones. Pollards (London), Tulse Hill (London), Whitehall (London), Wigston (Leicester): Siemens Bros. Newport (Mon), Hillside (London), Crown Hill (Plymouth), Plymouth, Castleford (Yorks), Monument (London): Automatic Electric Co. Dorking (Surrey): Ericsson Telephones.
Telephonic repeater equipment.—St. Margaret's Bay: G.E.C.
Pneumatic ticket tubes.—Birmingham Trunk Exchange: Standard Telephones.

CROWN AGENTS FOR THE COLONIES.

Rectifier and equipment.—Hewittic Electric Co.
Switches and fuses.—Standard Switchgear.

Ilford.—Works Committee. Accepted. Provision of traffic signals at Eastern Avenue (£554).—Automatic Electric Co., Ltd.
Electricity Committee. Accepted. 500-kVA transformer (£204).—Fuller Electrical & Manufacturing Co., Ltd.

Kettering.—Urban District Council. Accepted. Transformers (£9,438).—Brush Electrical Engineering Co., Ltd. Outdoor and indoor switchgear (£7,573) and outdoor switching station (£6,934).—English Electric Co., Ltd. Transmission lines (£17,611, subject to slight adjustment).—W. T. Henley's Telegraph Works Co., Ltd.

Leeds.—Electricity Committee. Accepted. Cables.—Macintosh Cable Co., Ltd. (£1,418); Edison Swan Cables, Ltd. (£512); Metropolitan Electric Cable and Construction Co., Ltd. (£1,935).

London.—ISLINGTON.—Electricity Committee. Recommended. Erection and maintenance of three neon signs on simple hire.—Violite, Ltd.
CITY CORPORATION. Markets Committee. Recommended. Installation of electric lighting at pedlars' market, Caledonian Road (£1,730).—Electrical Installations, Ltd.
ST. MARYLEBONE.—Electricity Committee. Recommended. Cables for twelve months.—Enfield Cable Works, Ltd.; British Insulated Cables, Ltd. (in lieu of tender for certain types of cables).
LONDON COUNTY COUNCIL.—Public Health Committee. Accepted. Electric lighting, power, clock, telephone, wireless and bell systems in the new ward block and stores at Lewisham Hospital (£1,825).—Pinching & Walton.
Local Government, Records and Museum Committee. Accepted. Wiring and fittings for electric lighting and power at Horniman Museum extension, Forest Hill (£325).—Buchanan and Curwen, Ltd.
ST. PANCRAS.—Contracts and Stores Committee. Recommended. Cable (£237).—Standard Telephones & Cables, Ltd. Five transformers (£768).—Electric Construction Co., Ltd. Switchgear for Cumberland Market and Leighton Road Estate sub-stations:—H.p. switchgear (£616).—A. Reyrolle & Co., Ltd. L.p. switchgear (£291).—English Electric Co., Ltd.

Salford.—Lighting Committee. Recommended. Three-phase oil-immersed power transformers for twelve months (£1,200).—Electric Construction Co., Ltd. Soot blowers (£139).—Babcock & Wilcox, Ltd.
Transport Committee. Recommended. Copper wire (£170).—F. Smith & Co.

Smethwick.—Hospital Committee. Accepted. Electrical installation at hospital extension (£178).—Etna Lighting & Heating Co., Ltd.

Taunton.—Town Council. Accepted. Rewiring twenty-four houses, including fittings and switches for six points at each house (£94).—F. J. Lock.

Notes

An E.P.E.A. Dinner

The North-West Midland Section of the Electrical Power Engineers' Association held its annual dinner and dance at the Victoria Hotel, Wolverhampton, on October 19th, the attendance exceeding 150. Mr. A. E. Newburn, the hon. treasurer of the Section, took the chair, and the toast of "The Association" was proposed by Mr. T. A. G. Margary (borough electrical engineer, Wolverhampton). Mr. W. J. Oswald (hon. national treasurer), responding, dwelt on the achievements of the Association. It was, he said, the duty of every power engineer to join. There was no member who had not felt the benefits of the Association, and it was particularly disheartening to find members leaving after they had received benefits. Mr. Newburn, proposing a toast to "The Ladies," thought that engineers did not altogether pull their weight in popularising electricity by themselves using domestic electrical appliances. Mr. D. J. Duffy (president) spoke briefly. Mr. W. E. Fry is to be complimented on the excellent organisation.

I.E.E. Dinners

The annual dinner of the Meter and Instrument Section of the Institution of Electrical Engineers will be held on November 15th at Pagani's Restaurant, Great Portland Street, W. Applications for tickets (7s. 6d. each) should be made to Mr. P. F. Rowell, the secretary of the Institution, Savoy Place, W.C.

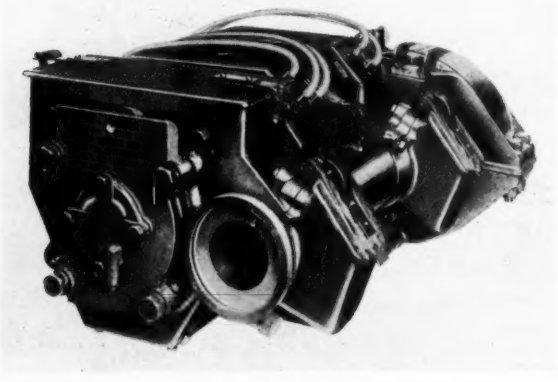
The Scottish Centre is holding its annual dinner on November 28th at the Grosvenor Restaurant, Glasgow. Tickets (17s. 6d. each) can be obtained from Mr. R. B. Mitchell, c/o 74, Waterloo Street, Glasgow.

The I.M.E.A. Convention, 1934

It is proposed to hold the thirty-ninth annual convention of the Incorporated Municipal Electrical Association during the week commencing June 4th, 1934.

New Tramcars for Liverpool

The new tramcars being built by Liverpool Corporation incorporate thirty car sets of Crompton-West electrical equipment, each of which comprises four 36 b.h.p. 275-volt motors, connected two in series, and arranged for series-parallel control. The normal acceleration is 2 m.p.h. per second, this performance being capable of improvement when necessary. The



One of the Liverpool tramcar motors

maximum speed of the cars on the level is 31 m.p.h., and complete braking equipment is provided. The trucks were made by the Electro-Mechanical Brake Co., Ltd., the motors at the Chelmsford works of Crompton Parkinson, Ltd., and the controllers by Allen West & Co., Ltd.

World Improvement in Electricity Consumption

The annual report of the Bank of Electrical Undertakings at Zurich states, according to *Reuter*, that sales of electricity in many countries were higher for the first six months of this year than for the corresponding period last year. The world industrial output in 1932 fell to 65 per cent. and world trade to 40 per cent. of the 1929 figures, but the production of electricity was only 10 to 20 per cent. below that of 1929, which had the largest output for any year. The relatively small effect of the trade depression is due to the obtaining of new consumers and, above all, to the greater use of electricity in homes and businesses, which offsets not in volume but in value the falling off in industrial power demands. In Switzerland receipts from small consumers are now from 60 to 80 per cent. of the total, although these take only from 40 to 50 per cent. of the kWh sold, and other countries have had similar experience.

Discharge Tubes in a Magnetic Field

The effect of a longitudinal magnetic field on the glow discharge in a helium tube is described in *Nature*. Within a certain range of pressure both the cathode glow and anode spot increased considerably in intensity, and the number of stronger flashes shot out from the anode spot per unit time was shown (by the use of a falling-plate camera) to have also increased as soon as the magnetic field was applied, and there was a sudden appearance of a bright pink ring around the anode spot. Variation in colour at different portions of the tube was characteristic, both the anode spot and the straight discharge from it being yellow, and the cathode glow yellow mixed with pink.

A spectrographic study revealed that, whereas the anode spot gives mainly the atomic (line) spectrum of helium, the pink ring is very rich in the molecular (band) spectrum of the gas. It was known that the band spectrum of helium comes out strongly when a condensed discharge is passed through a helium tube of fairly wide bore and filled at the proper pressure, or in the cathode glow of a d.c. discharge where the yellow of the helium is mixed with pink, but the appearance of a pink ring only after the magnetic field had been formed appears to be novel and may provide another way of getting a fairly strong source of light for the study of the band spectrum of helium.

In the experiment each of the electrodes, or at times the anode part only, was placed between the gap of a large electromagnet giving a field of 1,800 gauss. The distance between the electrodes was 11 cm. in a tube of 4 cm. diameter, and the pressure of helium was 35 mm. The current in the tube, supplied from a 2 kW generator, was 185 mA at a terminal voltage of 425 V.

Water Power in Austria

In the course of a Department of Overseas Trade report on conditions in Austria (Stationery Office, 2s. net), Mr. E. C. Donaldson Rawlins, Commercial Counsellor at Vienna, quotes official figures submitted by the Austrian National Committee to the World Power Conference relating to the country's hydro-electric resources. These are shown in the table below:—

	Annual capacity. In million kWh.		Increase.	Total available water power in million kWh.	Proportion harnessed.
	1918.	1933.			
Lower Austria and Vienna	162	303	77%	6,600	4.6%
Upper Austria	195	391	100%	4,000	9.8%
Salzburg	154	327	114%	2,100	15.6%
Styria	242	665	175%	4,100	16.2%
Carinthia	137	267	95%	3,100	8.6%
Tyrol	294	607	106%	4,100	14.8%
Vorarlberg	96	318	231%	1,000	32.0%
	1,280	2,878	125%	25,000	11.5%

The O.L.A. Conversazione

The annual conversazione of the Overhead Lines Association will be held in the Georgian Restaurant of Harrods, Ltd., Knightsbridge, on Friday, November 17th.

Appointments Vacant

Lady demonstrator for Bedford Electricity Department.

Assistant station engineer at the power station, Royal Arsenal, Woolwich.

Combustion and efficiency engineer for the Limehouse power station of Stepney Borough Council.

(See our classified advertisements.)

Forthcoming Events

Birmingham Electric Club.—Friday, October 27th. Grand, Hotel, Birmingham. 7 p.m. "Testing of Full Size Transmission Line Supports." Mr. C. O. Boyse.

Institution of Electrical Engineers.—Monday, October 30th. Institution, London. 7 p.m. Informal meeting. Discussion on "Can Underground Cables be used Economically for 11,000-V Distribution?" opened by Mr. P. V. Hunter (president). (*North-Eastern Students' Section*).—Friday, October 27th. Armstrong College, Newcastle-on-Tyne. 7.15 p.m. "The Dunston 50-Cycle Power Station." Mr. A. S. Carr. Friday, November 3rd. Grand Assembly Rooms, Newcastle-on-Tyne. Annual dance. (*Wireless Section*).—Wednesday, November 1st. Institution, London. 6 p.m. Chairman's address. Mr. G. Shearing. (*Irish Centre, Dublin*).—Thursday, November 2nd. Trinity College, Dublin. 7.45 p.m. Chairman's address. Mr. F. C. Porte. (*Meter and Instrument Section*).—Friday, November 3rd. Institution, London. 7 p.m. Chairman's address. Mr. W. Lawson. (*North Midland Students' Section*).—Saturday, November 4th. 2.30 p.m. Visit to the works of the Hunslet Engine Co., Ltd., Leeds.

Edinburgh Electrical Society.—Wednesday, November 1st. Philosophical Institution, Edinburgh. 8 p.m. "Some Factory Difficulties in Electrification." Mr. C. S. Buyers.

Junior Institution of Engineers.—Friday, November 3rd. Institution, London. 7.30 p.m. "Safety and Efficiency in Electrical Installation Work." Mr. W. F. C. Cooper.

Physical Society.—Friday, November 3rd. Imperial College of Science and Technology, South Kensington, S.W. 5 p.m. Short papers.

Association of Mining Electrical Engineers (*South Wales Branch*).—Saturday, November 4th. South Wales Institute of Engineers, Cardiff. 6 p.m. "Turbo Compressors." Mr. R. R. Huitson.

Institution of Mechanical Engineers.—Saturday, November 4th. Visit to the London Power Co.'s Battersea power station.

Makers' Names Wanted

SANAX vibrator.

VIBROFIX vibrator.

AURORA revolving globe sign.

Our Personal Column

Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements

Mr. J. L. Hill, superintending engineer of the South African Posts and Telegraphs Department, is retiring at the end of the current month, after thirty-one years' service in South Africa. Mr. Hill began as a telegraphist in the Bristol Post Office in 1889, and was transferred to the engineering branch in 1894. During the South African War he accompanied the British Forces, and remained in South Africa. In 1902 he joined the engineering branch of the Post Office in the Transvaal, having the rank of inspector, at Pretoria. Later, he was transferred to Johannesburg, and when Union took place he was given charge of the Transvaal district. In the Great War Mr. Hill served with the South African Forces in France, and was awarded the Military Cross. He was appointed superintending engineer for the Union in 1929, and has been responsible for carrying out many important developments in both telegraphs and telephones. These include the recent installation of automatic exchanges on the Witwatersrand, ten of which are now in operation; also the automatic exchanges at East London and in the Cape Peninsula, where four such exchanges will be opened in December. Under Mr. Hill, the long-distance telephone has been extended both in the Union and to adjoining territories, notably to Lourenço Marques, which was opened two years ago, while a similar service to Rhodesia will be opened in a few weeks.

Mr. H. C. Weeks, who, as reported in our last issue, has retired from the Sun Electrical Co., Ltd.

Mr. R. H. Holmes, who has been electrical engineer to the Shoeburyness Urban District Council, has been appointed by Southend-on-Sea Corporation as assistant sales engineer, following the incorporation of Shoeburyness into the borough.

The Bingley Urban District Council has restored the cuts in salaries made two years ago to all officials in receipt of £250 per annum and over. It has also increased the salary of **Mr. O. G. Cook,** the chief electrical engineer and manager.

Mr. J. W. Robertshaw, of Bradford, has been appointed by Messrs. Johnson & Phillips, Ltd., as representative in the Yorkshire area. For the past eleven years he has been with the Metropolitan-Vickers Electrical Co., Ltd., Leeds. Mr. Robertshaw is operating from 56, Whitby Road, Toller Lane, Bradford.

Alderman R. Richardson, of Hull, has been nominated by the employers' side of the National Joint Industrial Council for the Electricity Supply Industry for election to the Council's Negotiating Committee in the place of the late Alderman J. A. G. Beaumont. Alderman Richardson has been a member of the Council since 1923.

Mr. Ramsay MacDonald, with the Postmaster-General, examining a teleprinter at the new G.P.O. **(See page 582)**

Professor H. M. Macdonald, of the Chair of Mathematics in Aberdeen University, a pioneer in connection with wireless waves, was honoured by a large company in the Aberdeen Art Gallery on October 20th, when his portrait in oils, painted by Mr. Grenville Eves, A.R.A., was handed to Aberdeen University by the Lord Provost. His Lordship recalled that in 1901 Professor Macdonald was awarded the Adams prize for an essay, subsequently expanded into the volume on electric waves, which confirmed his reputation as one of the greatest mathematicians in Europe.

Mr. S. J. G. Burrows, who is on the staff of the Ramsgate & District Electric Supply Co., Ltd., was married on October 14th to Miss E. M. Bingham, and has been presented by his colleagues with a clock and electrical appliances.

Miss Blanche Margaret Siddeley, daughter of Mr. and Mrs. H. C. Siddeley, late of Warlingham and now of Cable Santa Fé 1613, Buenos Aires, is to marry Mr. C. Brook, on November 8th, at St. John's Pro-Cathedral, Buenos Aires. Mr. Siddeley is special representative of B.E.A.M.A. in Argentina.

Mr. A. H. Bennett has been appointed by the Weymouth Town Council as manager of the electricity showrooms, and Miss Beryl White, of Penarth, as lady demonstrator.

Mr. G. A. Proctor has been appointed sales manager of the Manchester Corporation Electricity Department in succession to Mr. C. H. Rayner, who recently retired from the service of the Corporation. **Mr. W. Tommins** has been appointed assistant sales manager.

Mr. H. Williman, managing director of the Atlas Carbon & Battery Co., Ltd., has been elected Mayor of Lambeth for the ensuing year. Mr. Williman has had a varied career, commencing work at the age of twelve in the boot and shoe trade. Some years later he entered the bakery and catering trades, and, after war work, travelled extensively on the Continent, in Canada, and the United States. He joined the Atlas Carbon Co. in 1929. Mr. Williman is a member of the Worshipful Company of Wheelwrights, and a Freeman of the City of London.

Mr. H. Williman

Mr. J. W. Ryde, the author of the article on "Electric Discharge Lamps," which appears on p. 583 of this issue, is a member of Mr. C. C. Paterson's staff at the research laboratories of the General Electric Co., Ltd., Wembley. Speaking of the "Osira" lamp installation at Watford Road, Wembley, last March, Sir Hugo Hirst, Bt., referred to the lamp as the product of team work in the company's laboratories, in which Mr. J. W. Ryde played a prominent part.

Mr. A. E. Eats, who was previously with Messrs. Landis & Gyr, Ltd., for a number of years, has recently been appointed representative with Wootton & Co., Ltd., electrical woodwork specialists, of Ponders End, in which capacity he will deputise for Mr. C. W. Wootton.

Obituary

Dr. D. Miller Muir.—The death occurred on October 18th, at Exeter, of Dr. D. Miller Muir, the distinguished radiologist, at the age of forty-six. Educated at Cambridge University, he worked in the Cavendish Laboratory under Sir J. J. Thomson, and on leaving Cambridge went to St. Bartholomew's Hospital. After war service, he went to Exeter as a partner of Dr. Harris, radiologist, and later took over the whole of the work of his department at the Royal Devon and Exeter Hospital, raising the Radiological and Electrical Department into a position of the first rank.

Alderman J. A. G. Beaumont.—At a meeting of the National Joint Industrial Council for the Electricity Supply Industry, held on October 20th, a resolution was adopted expressing sympathy with the relatives of the late Alderman J. A. G. Beaumont, who had served on the National Council since its establishment in 1919. Tributes were paid to the excellent services which he had rendered to the Council.

Mr. R. J. Brooksbank.—The death has taken place, from injuries sustained whilst motor cycling, of Mr. Robert James Brooksbank, who was employed at the works of the Metropolitan-Vickers Electrical Co., Ltd., Trafford Park, Manchester. He was twenty-four years of age, and served his apprenticeship with the company.

Mr. F. M. Green.—The death occurred on October 20th, at Heathcote, Bowes Hill, Rowlands Castle, of Mr. Frank Menzies Green, representative of Messrs. Fraser & Chalmers, Erith.

Will.—Sir Kenyon P. Vaughan-Morgan, vice-chairman of the Morgan Crucible Co., Ltd., left £176,031 (net personalty £162,757).

Electrostatic Dust Separation

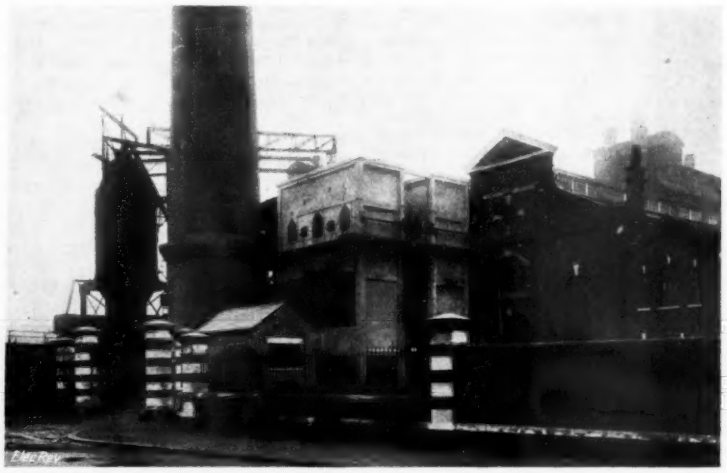
WITH pulverised-fuel firing the dust discharged from the chimney may be from 50 to 75 per cent. of the total ash in the coal, and both the Hams Hall and Nechells stations are to be equipped with "Lodge-Cottrell" electrostatic plant with a view to eliminating nuisance from this curse.

One difficulty is the extremely finely divided character of this dust, which may contain up to 75 per cent. below 10 microns in size (1 micron = one thousandth part of a millimetre), each ton of coal gives from 500,000 to 600,000 cu. ft. of combustion gases at from 250 to 300 deg. F. The electrostatic method is claimed not only to remove from 90 to 95 per cent. of the total dust but also practically as high a proportion of the very smallest particles, below 10 microns. The dust is removed in the dry state, and there is no reduction in the chimney draught.

About forty power stations are equipped with electrostatic plant (including Willesden and a number of stations in Germany, Belgium and the United States). More than 3,000 electro-filters are also operating in many different industries for dust separation in Great Britain and on the Continent.

This very substantial advance is largely due to the close working arrangements, with free interchange of experience and discoveries, since 1930 between the various principal companies concerned with electrostatic methods in Great Britain, the United States, and Germany. As a result the selling costs have been greatly reduced and numerous improvements have been effected, so that the power consumption is now only 1½ to 2 kWh per 1,000,000 cu. ft. of combustion gases treated, and the costs of repairs and maintenance are low.

The practical pioneer of electrostatic precipitation was Sir Oliver Lodge, two of whose sons formed the Lodge Fume Deposit Company. Later there was an amalgamation with Dr. F. G. Cottrell in the United States, resulting in Lodge-Cottrell, Ltd., while Dr. Erwin Moller also carried out important independent work in Germany. After the war the various interests came to a tentative arrangement which developed into the present agreement between the six firms concerned, Lodge-Cottrell, Ltd., for the British Empire, the Western Precipitation Co., Ltd., and the Research Corporation for America, and the Lurgi Apparatebau and Siemens-Schuckertwerke A.G. for Germany and the Continent of Europe. Before this international co-operation there had been a tendency for the three countries to develop electrostatic precipitation more in one direction than another. Thus in the United States cement kiln gases and detarring of coke-oven gas and water gas had occupied a prominent place, whereas in Germany the separation of dust from smelter gases and in the chemical industries had been more actively developed; in Great Britain much attention had been concentrated upon blast furnace gas. Now the treatment of combustion gases from power stations is becoming a major application in all three countries.



Lodge-Cottrell electrostatic dust-separator plant at the Willesden power station built in two units between the chimney and the boiler house, the small transformer building being just inside the entrance

Financial Section

New Companies, Returns of Share Capital, Debenture Charges, Reports of Electrical Companies, Dividend Changes, Transactions in Stocks and Shares

New Companies Registered

F. Hulme & Co., Ltd.—Private company. Registered October 16th. Capital, £2,000 in 1,900 redeemable cumulative 6 per cent. preference and 100 ordinary shares of £1 each. The objects are to carry on the business of electricians, electrical, mechanical, motor, telephonic, radio-telephonic, and general engineers, &c. The directors are: Mrs. E. Hulme and Miss H. Hulme, both of Ivy Lodge, Sharpe Road, Sale, Ches. Registered office: 78, George Street, Manchester.

Albert E. Sudlow & Co., Ltd.—Private company. Registered October 16th. Capital, £3,750 in £1 shares. Objects: To acquire the business of an electrical engineer and contractor carried on by Albert E. Sudlow at 60, George Street, Manchester. The directors are: Albert E. Sudlow and Mrs. B. M. Sudlow, both of 5, King's Road, Alexandra Park, Manchester.

Lotus Radio (1933), Ltd.—Private company. Registered October 18th. Capital, £1,000 in £1 shares. Objects: To carry on the business of manufacturers and retailers of and dealers in goods of every description in connection with wireless telegraphy, telephony and television, and to acquire the trade marks "Lotus" numbered 455998, 478224, 524960 and 524961. The subscribers are: A. Kinge, 6, Lloyd Avenue, S.W.16; and A. T. Winfield, 131, Grant Road, S.W.11. Registered office: 80, Rochester Row, Westminster, S.W.1.

"Mirak" Manufacturing Co., Ltd.—Private company. Registered October 18th. Capital, £100 in 1s. shares. Objects: To acquire the business of a sparking plug manufacturer and renovator now carried on by Richard Bishop as "R. Bishop" at Bridge Works, Old Bridge Street, Hampton Wick, and to carry on the same and the business of manufacturers of and dealers in all kinds of insulating materials, electrical and radio engineers, &c. The directors are: R. Bishop, The Maples, Upper Teddington Road, Hampton Wick, and three others. Registered office: 5, John Street, Bedford Row, W.C.1.

Willdays (Derby), Ltd.—Private company. Registered October 18th. Capital, £2,000 in £1 shares. Objects: To acquire the business of a dealer in radio goods and accessories and general electrical engineer carried on by Harold Willday at 178, Osmaston Road, Derby. The directors are: Harold Willday and Mrs. Annie Willday, both of 4, Dig Street, Ashbourne. Solicitors: Flint, Marsden & Bishop, 42, Full Street, Derby.

Pendleton Electrical and Wireless Co., Ltd.—Private company.—Registered October 18th. Capital, £100 in £1 shares. Objects: To carry on the business of manufacturers of and wholesale and retail dealers in electrical apparatus, radio, television and other sound-producing or musical instruments and accessories, &c. The subscribers are: Louisa B. Cooper and Douglas L. Cooper, both of 1, Leaf Square, Pendleton, Salford. Registered office: 1, Leaf Square, Pendleton, Salford.

Broadcast Exchanges, Ltd.—Private company. Registered October 19th. Capital, £2,000 in £1 shares (1,000 preferred ordinary and 1,000 ordinary). Objects: To establish and develop services for the relaying of wireless broadcast programmes, &c. The directors are: W. P. E. Darwen, "Wendela," White Rose Lane, Woking (director, Wireless Services, Ltd.); and M. G. Ransome, Hesketh House, Newark-on-Trent, Notts. Registered office: 126, St. Albans Avenue, Acton, Mddx.

Northampton Wireless Relay, Ltd.—Private company. Registered October 19th. Capital, £3,000 in £1 shares. Objects: To carry on the business of receiving and relaying wireless broadcast programmes, &c. The subscribers are: Raymond G. Turner, 6, Kingsley Park Terrace, Northampton; and Wm. T. Cooper-Smeathers, "Beggars' Roost," High Street, Hardingstone, Northants. Raymond G. Turner signs documents as director. Registered office: 26, Horsemarket, Northampton.

Gollings & Ayres, Ltd.—Private company. Registered October 21st. Capital, £1,000 in £1 shares. Objects: To carry on the business of manufacturers and repairers of and dealers in electrical accumulators, batteries, acids and containers, dynamos, motors, transformers, magnetos and electrical plant, &c. The directors are: G. Ayres, 123, Gladstone Street, Bedford (director, Bedford Battery Co., Ltd.); C. G. Ayres, 13, Alexander Road, Bedford, and W. G. Gollings, 21, Tavistock Street, Bedford. Registered office: 17, St. Paul's Square, Bedford.

C.E. Sales Corporation, Ltd.—Private company. Registered October 20th. Capital, £100 in £1 shares. Objects: To carry on the business of electricians, electrical and general engineers, manufacturers of and dealers in electric lamps, fittings, illuminated signs, dynamos, &c. The directors are: D. A. Collier, 34, Panmuir Road, Wimbledon, S.W.20, and G. E. Evershed, Thanet Lodge, 60, The Ridgeway, Wimbledon, S.W.19. Registered office: 119, Fleet Street, E.C.

Harley-Miller Patents, Ltd.—Private company. Registered October 17th. Capital, £500 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in mechanical toys and games, dynamos, motors, armatures, magnetos, batteries, &c. The directors are: B. Stitcher, 639, Lea Bridge Road, Leyton, E.10, and three others. Secretary: G. T. Bradshaw. Registered office: 23, Ferndale Avenue, Whipps Cross, E.17.

Neon Duplexigns, Ltd.—Private company. Registered October 19th. Capital, £1,000 in £1 shares. Objects: To carry on the business of manufacturers of electric and luminous signs and accessories, &c. The directors are: M. Goldberg, 8, Leweston Place, N.16; M. Denton, 96, Dovercourt Road, S.E.22, and B. Josephson, 53, North End, Croydon, Surrey. Registered office: 10 & 11, Archer Street, W.1.

Non-Directional Microphone Co., Ltd.—Private company. Registered October 11th. Capital, £100 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in microphones, telephones, wireless, electric, magnetic, galvanic and other equipment and apparatus, mechanical and electrical engineers and contractors, &c. The subscribers (each with one share) are: W. W. Hunt, 9, Carlos Place, Grosvenor Square, W.1; and F. G. Wates, 9, Carlos Place, Grosvenor Square, W.1. Solicitors: Forsyte, Kerman & Phillips, 9, Carlos Place, W.1.

Hughes Electric Supplies, Ltd.—Private company. Registered October 11th. Capital, £100 in £1 shares. Objects: To carry on the business of electricians, electrical and mechanical engineers, radio engineers, &c. The directors are: Mrs. D. M. Hughes, Mansion House, Old Whittington, Chesterfield; and M. J. Whitehead, 12, Slayleigh Lane, Fulwood, Sheffield. Registered office: 15, Church Street, Old Whittington, Chesterfield.

Morp, Ltd.—Private company. Registered October 12th. Capital, £100 in 1s. shares. Objects: To carry on the business of manufacturers, importers and exporters, manufacturers' agents, distributors and dealers in all kinds of wireless and electrical apparatus and equipment, &c. The subscribers are: H. S. Weber, 114, Tollington Park, N.4 (who signs documents as director), and two others. Registered office: 30, Oxford Road, Finsbury Park, N.4.

Harmony Electrix, Ltd.—Private company. Registered October 12th. Capital, £100 in £1 shares. Objects: To carry on the business of electricians, electrical, wireless, mechanical and general engineers, &c. The permanent directors are: G. F. Nelson (chairman), 1, Banbury Road, Oxford, and W. Kenyon (managing director), 63, George Street, Summertown, Oxford.

Stanford Engineering Co., Ltd.—Private company. Registered in Edinburgh October 13th. Capital, £500 in 400 12½ per cent. non-cumulative preference shares of £1 each and 2,000 ordinary shares of 1s. Objects: To carry on the business of electrical, mechanical and general engineers and contractors, &c. The directors are: H. R. Classen, 34, Windsor Terrace, Glasgow; and William Kidd, 42, Cromwell Street, Glasgow. Secretaries: R. S. Turnbull & Co. Registered office: 160, Hope Street, Glasgow.

Refrigerators, Ltd.—This company's registration was recorded in our last issue. The name of the first director and secretary is Andrew J. Doyle, not J. Doyle as stated. The company are the sole authorised distributors in the Irish Free State for the B.T.-H. refrigerator.

Returns of Electrical Companies

Young, Osmond & Young, Ltd.—Satisfaction in full on September 18th, 1933, of charge dated October 23rd, 1930, and registered October 29th, 1930. According to the register of mortgages the charge registered October 29th, 1930, originally secured all moneys not exceeding £12,000.

R. Darbyshire, Ltd.—Mortgage on properties in Blackpool, dated October 3rd, 1933, to secure £1,000. Holder: C. Walsh. "Ormond," Bispham Road, Carleton, near Blackpool.

Community Radio (1928), Ltd.—Equitable charge on Bungalow, Kilm House Lane, St. Annes-on-Sea, dated September 21st, 1933, to secure £150. Holder: A. T. Liner, "Bylands," Clifton Drive, Lytham.

Magneto & Battery Services, Ltd.—Issue on October 11th, 1933, of £300 debentures, part of a series already registered.

Supra Electra Motors, Ltd.—Issue on October 6th, 1933, of £200 debentures, part of a series already registered.

Siemens Bros. & Co., Ltd.—Capital, £3,000,000 in 550,000 10 per cent. cumulative preference and 2,450,000 ordinary shares of £1 each. Return dated June 8th, 1933. All shares taken up. £3,000,000 paid. Mortgages and charges, £575,300.

Johnson & Tanner, Ltd.—Capital, £2,500 in 1,000 preference shares of £1 and 30,000 ordinary shares of 1s. Return dated May 9th, 1933. 1,000 preference and 25,050 ordinary shares taken up. £1,252 10s. paid on 1,000 preference and 5,050 ordinary shares. £1,000 considered as paid on 20,000 ordinary shares. Mortgages and charges, £1,380.

Newcastle and District Electric Lighting Co., Ltd.—Satisfaction in full on October 10th, 1933, of a trust deed dated June 6th, 1912, and registered June 21st, 1912, has been notified. (According to the register of mortgages, the trust deed registered June 21st, 1912, originally secured £150,000 second debentures and a premium of 5 per cent.)

Violite (1933), Ltd.—Debenture dated September 22nd, 1933, to secure £4,000, charged on the company's undertaking, assets and uncalled capital. Holder: J. Metcalfe, 112, Widmore Road, Bromley.

Amcolite, Ltd.—Debenture dated October 5th, 1933, to secure £1,000, charged on the company's property, present and future, including uncalled capital. Holder: H. Taylor, Bath Vale House, Congleton, Ches.

Associated Utilities, Ltd.—This company's capital has been increased by £100,000 in £1 ordinary shares, and not £10,000 as stated in our last issue.

R. F. Winder, Ltd.—Capital, £12,000 in £1 shares. Return dated June 16th, 1933. 10,300 shares taken up. £10,300 paid. Mortgages and charges, nil.

W. H. Porter & Co., Ltd.—Capital, £100 in £1 shares. Return dated August 25th, 1933. 90 shares taken up. £90 paid. Mortgages and charges: £2,000.

Sturge & Baker, Ltd.—Capital, £8,000 in £1 shares (1,500 preference and 6,500 ordinary). Return dated June 9th, 1933. 1,500 preference and 5,896 ordinary shares taken up. £7,396 considered as paid. Mortgages and charges, nil.

Pritchett & Gold & E.P.S. Co., Ltd.—Capital, £200,000 in 100,000 preference and 100,000 ordinary shares of £1 each. Return dated April 3rd, 1933. All shares taken up. £30,394 paid on 15,233 preference and 15,161 ordinary shares, £169,606 considered as paid on 84,767 preference and 84,839 ordinary shares. Mortgages and charges, nil.

Sykes & Dyson, Ltd.—Capital, £6,000 in £1 shares. Return dated June 10th, 1933. 5,000 shares taken up. £1,780 paid. £3,220 considered as paid. Mortgages and charges, £299.

Portland Radio Co., Ltd.—Debenture dated October 2nd, 1933, to secure £500, charged on the company's property, present and future, including uncalled capital. Holder: H. Everett, 116, Court Lane, S.E.21.

Wireless Instruments (Leeds), Ltd.—Issue on October 4th, 1933, of £900 debentures, part of a series already registered.

City Notes

The Bengal Telephone Corporation, Ltd., reports that after the payment of the interest on mortgage bonds and providing for sinking fund and depreciation, the profit for the year ended June 30th last was Rs.7,31,141, as compared with Rs.6,31,436. To this is added Rs.1,30,911 brought in. It is proposed to pay an ordinary dividend of 8 per cent. (against 6 per cent.), and to carry forward Rs.1,62,148. Exchange lines working numbered 10,939, against 10,698, extensions 3,698 (3,696), and private lines 640 (574). All outstanding bonds will be redeemed on December 31st, and to provide for their redemption new ordinary shares at par will be offered to shareholders in the proportion of one for every two held.

Herbert Morris, Ltd., report a net profit for the year ended July 31st last of £29,901, as compared with £51,687 in 1931-32. The latter figure was arrived at after writing off the sum allocated to goodwill on account of the purchase of the crane business of Craven Bros. (Manchester), Ltd. A dividend of 10 per cent. is again recommended on the ordinary shares, and £10,000 is placed to reserve, leaving £24,674 to be carried forward, against £41,773 brought in. The report states that substantial orders were few and competition keen, consequently prices have been on the low side with an adverse effect on the profits.

The Bagdad Light & Power Co. reports that the revenue from the sale of electricity in 1932, together with sundry income totalled £52,379, as compared with £49,706 in 1931. Generation costs were £15,125 (against £15,475), and distribution costs were £2,865 (against £2,462). After meeting all expenses and placing £8,700 to depreciation reserve, there is a net profit of £8,601 which it is proposed to carry forward. The new power house plant was put into operation in April last. Extension of mains has been continued and the number of consumers has increased during the year. It is proposed to appoint Mr. S. H. Taylor as an additional director.

The Perak River Hydro-Electric Co. reports a net revenue of £51,507 for the year ended July 31st last, as compared with £88,198 in the preceding year. Interest and debenture redemption absorbed £107,337, and after deducting £16,170 brought in, there is a debit balance to be carried forward of £39,660. Owing to the revenue being insufficient to meet the £1,200,000 five per cent. guaranteed debenture interest and sinking fund charges, the guarantors under the Trade Facilities Acts (the British Government) were called upon to pay £53,134. The report states that the further reduction of output under the tin restriction scheme resulted in a large fall in output and revenue. Returns since the close of the financial year show a considerable improvement.

The Cawnpore Electric Supply Corporation, Ltd., has declared an interim ordinary dividend of 3 per cent. (same), less tax at 2s. 6d.

The Ever Ready Co. (Great Britain), Ltd., is maintaining the interim ordinary dividend at 10 per cent. The directors announce that the sales for the period April 1st to September 30th have been more than maintained.

The Shawinigan Water & Power Co. has declared a dividend of 12 cents per share on the common shares for the quarter ended September 30th.

Stocks and Shares

TUESDAY EVENING.

FRANCE has assumed the leadership of international politics, so far as the Stock Exchange is concerned, this week. Last time we wrote it was German whose defection from the League of Nations had created confusion in Stock Exchange markets. The American position continues to cause no little nervousness, but from the acute point of view the French political crisis in the early part of this week dominated other influences. It revived vague talk of possibly higher money rates, and thereby held investment in restraint. Business throughout the markets of the Stock Exchange as a whole is proceeding on quieter lines than those which have been general during the past few months, and October, which in the ordinary way brings a notable accession of activity to markets, has provided this year some of the quietest days which members have experienced during 1933.

The Stocks of Public Authorities

Central Electricity 3½ per cent. stock for 1963-1999 has eased off to 93¼, showing a fall of ¼ on the week. The 5 per cent. stock remains at 113. In the 4½ per cent. stocks, the only movement is a rise of ½ in London Passenger Transport "A" stock to 116½. Of the securities on offer in this group, £10,600 of the Central Electricity 3½ per cent. stock just mentioned can be obtained at 93¼, paying 3½ per cent. on the money.

The first interest payment is one of 20s. per cent., due on December 1st. The other Central Electricity stocks stand at prices which give practically the same yield, namely, 3¾ per cent., allowing for redemption.

Cables and Wireless

Imperial & International Communications publishes for September a more encouraging index number than it has done of late, and at 67.9 per cent. the proportion shows once more a tendency to advance. In each of the four previous months, May to August inclusive, the ratio had been going down, and the recovery in September is the more welcome on this account. The index number still is 3½ points lower than that of a year ago, when business was beginning to expand. Prices of the stocks are practically unchanged, interest in the group having dwindled to a point at which it requires very little offering of, or bidding for, stock to bring about a sharp change in values. So quiet is public interest in the stocks at the present time, however, that the quotations vary scarcely at all from day to day. Globe Telegraph & Trust ordinary have shed 5s. Great Northern Telegraphs remain at 32, there having been no further bout of profit-taking, such as that which occurred last week, when the price receded somewhat sharply after its previous jump. Marconi Marines at 28s. 9d. reflect the disappointment which continues to be felt with the reduction in the dividend.

Manufacturing and Equipment

The feature in the market for manufacturing shares has been a sharp rise in the price of Ericsson Telephone ordinary shares. Of these, a considerable line was placed earlier in the present month on the basis of 42s. Upon this becoming known, so considerable was the demand for the shares that the price rose by easy stages every day, and now stands in the neighbourhood of 52s. 6d. The inquiry for the shares has been prompted by unofficial statements that the company is doing exceedingly well, and that its business is expanding in all its branches. The price of the 7 per cent. cumulative preference shares is about 27s. 9d., but the supply available to a prospective purchaser is very limited. British Aluminium spurted to 30s., a rise of 1s. 9d., and a similar improvement carried Associated Electrical Industries preference to 32s. 6d. Business has been marked in Crompton Parkinson 8 per cent. preference at 32s., although the nominal quotation is left at 30s. Callender's retain their substantial rise at 68s. 3d., and Enfields at 4½. The market in all electrical manufacturing and equipment shares is a good one, by which is meant that the buying is better than the selling, and that, as a rule, it is easier to get the middle price for a seller than it is to obtain a supply at the middle quotation for a client who wishes to buy. Telegraph Condenser ordinary are 1s. higher at 22s.

The India Rubber Plan

India Rubber, Gutta Percha & Telegraph shares are nominally unchanged at 3s. 3d. The reduction of the company's capital from £1,250,000 to £650,000 was confirmed early in this week by Mr. Justice Maughan. The reduction involves writing off £600,000 of capital lost or unrepresented by available assets. After certain formalities have been settled, it is intended to place 100,000 new ordinary shares with a company that is prepared to bring in the necessary finance. Ever-Ready shares at 29s. 3d. show a small decline. The company has declared an interim dividend of 10 per cent., the same as that of a year ago.

Electricity Supply Shares

North Metropolitans have been in steady request, and the price is now 60s. ex dividend. Reference was made here last week to a line of shares having become available, and it can now be stated that practically all these shares have been absorbed. West Gloucestershire ordinary at 68½ is a little lower, after its rise of 6 points last week. Bournemouth and Poole have gone back to 78s. 9d., and Scottish Power at 38s. 9d. are also 1/6 down. Preference shares remain in demand; North Metropolitan Electric 6 per cent. preference at 30s. 6d. have recovered the dividend deducted earlier this week, and North Eastern Electric 7 per cent. preference at 34s. show a gain of 1s. Victoria Falls at 5⅛ are 5s. down, the realisation of shares in a deceased account being considered responsible for the decline. Atlas Light & Power, after being rather better, eased off to 9s. 4½d. British Light and Power are steady at 20s. Llanelly ordinary at 25s. 9d. show a few pence advance.

Dollar Stocks

American and Canadian issues are moving abruptly. The cable companies' stocks have weakened. American "Tel. and Tel." is down 3, to 127½; Internationals have receded to 11½. Power Corporation of Canada shares are down to 7¾, Shawinigans to 17½. Montreal Light & Power touched 35 before rallying to 36½. A few of the Brazilian stocks have taken a turn for the better. President Roosevelt's avowed intention to raise the prices of commodities has helped the rubber share market, where a mild improvement has occurred. In the rubber share market, by the way, a motor car changed hands the other day at ten shillings and sevenpence halfpenny. The car was duly delivered to, and paid for by, the purchaser.

Reverting to sterling shares, Babcock & Wilcox hold, at 39s. 6d., their last week's recovery. The iron and steel group remains steady as a whole.

Share List of Electrical Companies

	Nom.	Approx. Dividend. 1931.	1932.	Price, Oct. 24.	Rise or Fall.	Yield. p.c. £ s. d.
Home Electricity Companies.						
Bournemouth and Poole	1	15	15	78/9	—⅛	3 16 0
Brompton Ordinary	1	8½	7	33/–	—	4 4 10
Charing Cross Ordinary	1	8½	7	34/6	—	4 1 2
Chelsea	1	8½	7	32/6	—	4 6 2
City of London	1	10	10	33/9	—	4 3 0
Clyde Valley	1	7	7	39/6	—	3 11 0
County of London	1	10½	10½	57/–	—⅛	3 13 8
Edmundson's 7% Pref.	1	7	7	34/–	—	4 2 4
Elec. Dis. Yorkshire	1	9	9	47/6	—⅛	3 15 9
Elec. Supply Corporation	1	11	11	80/–	—	2 15 0
Kensington Ordinary	1	8	7	34/–	—	4 2 4
Lancs Light and Power	1	7	7	36/6	—	3 17 2
London Electric	1	9	7	34/–	+ 6d.	4 2 4
Metropolitan	1	10	10	52/6	—	3 16 0
Midland Counties	1	7	7	37/–	xd.—	3 15 8
Mid. Elec. Power	1	8	8	45/–	—	3 11 1
North Eastern Electric Ordinary	1	6	6	33/–	—6d.	3 12 8
Do. 7% Pref.	1	7	7	34/–	+1/–	4 2 4
Northampton	1	10	10	55/–	—	3 12 9
Notting Hill 6% Pref.	10	6	6	13½	—	4 8 11
North Met. Elec. 6% Pref.	1	6	6	30/–	xd. + 6d.	4 0 0
St. James' and Pall Mall	1	8	7	34/–	—	4 2 4
Scottish Power	1	8	8	38/9	—⅛	4 2 6
South London	1	8½	7	33/6	—	4 3 7
Westminster Ordinary	1	8½	7	34/–	—	4 2 4
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	21/3	—	7 1 2
Yorkshire Elec.	1	8	8	47/6	—	3 7 6
Public Boards.						
Central Electricity, 1950–70 ... Stock		5	5	113	—	4 8 6
Do. 1951–73 ... „		4½	4½	109½	—	4 2 2
Do. 1963–93 ... „		—	3½	93½	–½	3 14 10
London & Home Counties, 1955–75 „		4½	4½	110	—	4 1 10
London Passenger Transport, A ... „		—	4½	116½	+½	3 17 3
Do. do. B ... „		—	5	119½	—	4 3 8
Do. do. C ... „		—	—	86	—	—
Telegraph and Telephones.						
American Tel. & Tel. ... $100		9	9	127½	—3	7 1 2
Anglo-Am. Tel. Pref. ... Stock		6	6	111xd.	+1	5 5 3
Do. Def. ... „		1½	1½	29	+½	5 5 3
Cables & Wireless 5½% Pref. „		2¾	2¾	76½	—	3 11 11
Do. A 7½% Ord. „		Nil	Nil	26	—	—
Do. B Ord. „		Nil	Nil	12½	—	—
Globe Tel. and T. Ord.	10	Nil	2½	10½	–½	2 7 9
Do. do. Pref.	10	6	6	12½	—	4 16 0
Great Northern Tel.	10	20	20	32	—	6 5 0
Marconi-Marine	1	10	7½	28/9	—	5 9 1
Oriental Telephone Ord.	1	12	12	2¾	—	*4 3 6
Home and Foreign Trams, Etc.						
Anglo-Arg. Trams First Pref.	5	Nil	Nil	4/6	—	—
Do. do. 2nd Pref.	5	Nil	Nil	1/6	—	—
Do. do. 5% Deb. ... Stock		Nil	Nil	7½	—	—
British Electric Traction Df. Ord. „		5	5	500	—	—
Do. do. Pref. Ord. „		8	8	141½	—	5 10 9
Brazil Traction ... 100		—	—	13¼	+¼	—
Brit. Columbia Elec. Rly. Pce. ... Stock		5	5	103	—	4 17 0
Mexico Trams, 5% Bonds ... —		5	5	31½	—	15 16 4
Mexican Light Common ... 100		Nil	Nil	7½	—	—
Do. 7% Pref. ... 100		7	7	11	—	—
Do. 1st Bonds ... —		5	5	50	—	10 0 0
Victoria Falls Ord.	1	15	20	5⅛	—¼	3 18 3
Yorkshire (West Riding)	1	Nil	Nil	15/–	—	—
Manufacturing Companies.						
Assoc. Elec. Ord.	1	4	4	20/–	—	4 0 0
Do. Pref.	1	8	8	32/6	+1/9	4 18 6
Babcock & Wilcox	1	14	9	39/6	—	4 11 2
British Aluminium Ord.	1	5	5xd.	30/–	+1/9	3 6 8
British Insulated Ord.	1	15	15	73/9	—	3 19 2
Brush Ord. ... Stock		Nil	Nil	37	—	—
Callender's	1	15	15	68/3	—	4 8 0
Do. 6½% Pref.	1	6½	6½	31/3	—	4 3 2
Crompton Parkinson Ord.	5/–	22½	—	18/3	—	6 5 7
Do. 8% Pref.	1	8	8	30/–	—	5 6 8
Edison-Swan 1st Pref.	1	7½	7½	24/6	—	6 2 5
Do. 5% Deb. ... Stock		5	5	102½	—	4 17 7
Electric Construction	1	Nil	Nil	8/9	—	—
Enfield Cable Ord.	1	25	25	93/9	—	5 6 5
English Electric	1	Nil	Nil	9/6	—6d.	—
Do. do. Pref.	1	Nil	Nil	15/–	—	—
Ever Ready	5/–	35	35	20/3	—3d.	5 10 6
Ferranti Pref.	1	7	7	27/–	—	5 3 8
G.E.C. Pref.	1	6½	6½	32/–	—	4 1 2
Do. Ord.	1	8	8	45/3	—	3 10 8
Henley's	1	30	30	6½	—	4 12 4
Do. 4½% Pref.	5	4½	4½	5½	—	4 5 9
India-Rubber	1	Nil	Nil	3/3	—	—
Johnson & Phillips	1	5	5	20/9	—	4 16 5
Siemens Ord.	1	7½	6½	23/9	—	5 9 5
Telegraph Construction	£1	Nil	Nil	23/9	—	—

* Dividends paid free of Income Tax.

Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parenthesis are those under which the specifications will be printed and abridged and all subsequent proceedings taken.

1931

29662. "Code telegraphic type-printing apparatus." L. I. Treml. December 24th, 1931. (399185.)
35857. "Electrically operated die-casting machines." D. Richards. December 29th, 1931. (399170.)

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5045. "Electrical control of apparatus in telegraph and like signalling systems." E. Steadman and Exchange Telegraph Co., Ltd. February 19th, 1932. (399148.)
5204. "Electric current regulating systems." E. A. Glaysher. December 8th, 1932. (399230.)
5586. "Television reception arrangement with Braun tube." M. Von Ardenne. March 6th, 1931 (Addition to 35266/31). (399192.)
7949. "Method of producing seamless loud-speaker diaphragms." R. O. Bridger. March 17th, 1932 (Cognate application 15225/32). (399165.)
8698. "Mercury-arc rectifiers." General Electric Co., Ltd., and E. Gallizia. March 23rd, 1932. (399195.)
8897. "Television and like apparatus." C. L. Richards and Baird Television, Ltd. March 24th, 1932. (399154.)
8989. "Electric circuit-breakers." J. Lucas, Ltd., and E. O. Turner. March 29th, 1932. (399181.)
9159. "Cases for subscribers' telephones." Telefonaktiebolaget L. M. Ericsson. April 4th, 1931. (399202.)
9334. "Telephone instruments." I. Hall. March 31st, 1932. (399212.)
9409. "Clock with combined electrically-operated audible and visible appointment and like reminders." G. F. Helmrich. April 1st, 1932. (399214.)
9423. "Terminal devices for electric cable systems." Siemens Bros. & Co., Ltd., and H. G. Wood. April 1st, 1932. (399215.)
9429. "Telephone and like signalling systems." Electrical Research Products, Inc. April 25th, 1931. (399216.)
9441. "Systems of electric motor control." British Thomson-Houston Co., Ltd. April 1st, 1931. (399218.)
9536. "Apparatus for actuating or controlling electrically-operated machines." H. Morris, Ltd., and G. A. Robertson. April 2nd, 1932. (399223.)
9774. "Electrical reproducers or pick-ups for gramophones." D. M. Mackie and A. MacWilliam. April 5th, 1932. (399231.)
10612. "Electric regulators." British Thomson-Houston Co., Ltd. April 17th, 1931. (399236.)
10661. "Permanent magnets." Darwins, Ltd., and W. Brown. April 14th, 1932. (399237.)
10955. "Voltage regulating systems." British Thomson-Houston Co., Ltd. April 17th, 1931. (399240.)
11498. "Keyboard controlled current impulse transmitters." H. Fuld and Co. Telephon und Telegraphenwerke Akt-Ges. June 25th, 1931 (Addition to 389999). (399242.)
11638. "Signals for indicating lamp failure." F. H. Sensiba and C. W. Sensiba. April 22nd, 1932. (399246.)
12692. "Electric switches for use in conjunction with weighing apparatus." W. and T. Avery, Ltd., and A. Leeson. May 3rd, 1932. (399249.)
16060. "Metal-vapour rectifiers." Akt-Ges. Brown Boveri et Cie. June 12th, 1931. (399275.)
16737. "Electric starting-motors." J. Bohli. June 14th, 1932. (399278.)
17390. "High-tension dynamo-electric machinery." English Electric Co., Ltd., and J. E. Calverley. June 20th, 1932. (399283.)
17386. "Conduit or electric cable racks." L. C. Cuthbertson and Associated Electrical Industries, Ltd. June 24th, 1932. (399285.)
18098. "Non-microphonic radio apparatus." W. H. Grimditch. June 26th, 1931. (399288.)
20116. "Manufacture of loudspeakers." Rola Co. September 29th, 1931. (399296.)
22485. "Electric fires." Ferranti, Ltd., and W. V. Butterfield. August 11th, 1932 (399302.)
26234. "Gas-tight vessels particularly electron-discharge tubes with indirectly heated cathodes." Igranic Electric Co., Ltd. (E. A. Giard and E. A. Fritz.) September 21st, 1932. (399311.)
27537. "Controllers for electric motors." Igranic Electric Co., Ltd. October 5th, 1931. (399316.)
28109. "Metal-vapour lamps." Quarzlampen-Ges. October 10th, 1931. (399317.)
28237. "Magnets." Deutsche Edelstahlwerke Akt-Ges. October 8th, 1931. (399318.)
29224. "Semi-automatic winding machine for producing electrodes for galvanic batteries." W. Hasse. June 23rd, 1932. (399324.)
34420. "Method of, and device for, converting sound vibrations into electric variations, more particularly for broadcasting purposes." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. December 5th, 1931. (399340.)
36530. "Control of electric motors." G. M. Pestarini. January 14th, 1932. (399351.)

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2758. "Implement for electric stunning of cattle." O. J. Mousfeldt and R. A. M. Leysohn (trading as Kemp and Lauritzen). February 29th, 1932. (399372.)
4546. "Spinning regulator for electrically driven ring spinning machines." Allmänna Svenska Elektriska Aktiebolaget and A. Johansson. February 14th, 1933. (399384.)
5223. "Combined electric flashlight and cigar or other lighter." United States Electric Manufacturing Corporation. February 20th, 1932. (Cognate application 5224/33.) (399386.)
5333. "Earthing devices for electrical apparatus." S. Kremner. February 21st, 1933. (399388.)
6185. "Amplifiers for photo-electric currents." M. Von Ardenne. May 2nd, 1931. (Divided application on 12546/32.) (399393.)
6686. "Arrangement for generating high-frequency potentials of straight line wave form." Radioakt-Ges., D. S. Loewe, and Dr. K. Schlesinger. March 7th, 1932. (399398.)
6749. "Electrolytic condensers." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. March 10th, 1932. (399400.)
7947. "Generator of relaxation oscillations of controlled frequency." Radioakt.-Ges. D. S. Loewe, and Dr. K. Schlesinger. March 17th, 1932. (399408.)
9765. "Electrical contact pins." E. Kleinmann and A. Mendel (trading as Kleinmann, Geb.). November 30th, 1932. (399415.)
11501. "Electro-magnetic rail brakes." Knorr-Bremse Akt-Ges. May 2nd, 1932. (399423.)
17331. "Television reception arrangement with Braun tube." M. Von Ardenne. December 23rd, 1930. (Divided application on 35266/31.) (399160.)
23647. "Electrical coupling plugs." J. A. Crabtree and B. G. Harrison. February 25th, 1932. (Divided application on 5611/32.) (399227.)

Trade Mark Applications

The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from October 18th:—

Siroma. No. 544353. Class 6. Electric vacuum cleaning machines.—Arthur Morris, trading as Arthur Morris & Co., 46, Commercial Street, E.1.

L.S.E., Red Band (lettering and design). No. 542342. Class 6. Electric motors.—Laurence, Scott & Electromotors, Ltd., Gothic Works, Hardy Road, Norwich.

Nat. No. 541423. Class 8. Instruments and apparatus, and parts thereof for use in radio-telegraphy and telephony, television, and sound reproducing and recording, and radio-telephonic and telegraphic apparatus in combination with gramophones.—T. B. Smith. 230, Soho Hill. Birmingham.

AvoMinor. No. 542807. Class 8. Electrical measuring and testing instruments.—Automatic Coil Winder and Electrical Maintenance Co., Ltd., Winder House, 21. Douglas Street, S.W.1.

Currus. No. 543773. All goods in Class 8.—Currus, Ltd., 204-206, Great Portland Street, W.1.

A Diesel-electric Ferry

THE twin-screw ferry vessel, *Scilla*, built for the Italian State Railway service between Villa San Giovanni, on the mainland, and Messina, in Sicily, about five miles away, has a length of 357 ft. and a maximum width of 58 ft., with a loaded displacement of 4,034 tons, and is claimed to be the largest ship of its kind in the world.

It is designed to accommodate a complete train, as well as passengers and road vehicles, and to convey early crops and fruit and vegetables from Sicily to Northern Italy and beyond with a saving of fully twenty-four hours over the time possible with the previous ferry, which has been operating since 1897. On the main deck are three rail tracks of a total length of 880 ft., sufficient for fourteen passenger coaches and luggage vans or twenty-eight trucks.

The motive power is provided by three Diesel eight-cylinder two-cycle single-acting Fiat engines, rated at 2,000 h.p. at 360 r.p.m. and 2,300 h.p. at 380 r.p.m. Each engine is direct coupled to a d.c. twin armature 320-V 2×500-kW generator and a 120-kW 220-V exciter. The engines and generators are situated amidships in separate compartments; the overall length of each set is about 67 ft.

The two propeller motors, which are in a separate compartment towards the rear of the vessel and controlled on the Ward-Leonard system, are of the double-armature reversible type with separate exciters, designed to develop continuously 2×1,000 h.p. at 190 propeller r.p.m. with power at 480 V per armature and 2×1,125 h.p. at 200 r.p.m. and 500 V per armature, with closed circuit ventilation similar to that used on the generators. One double-armature motor is in series with one section of each of the three twin generators; whatever the number of main engines and dynamos working, power can be equally divided between the two motors, or each motor can be driven independently of the other and at varying speeds.

In the engine room is also installed a Fiat 250-h.p. four-cylinder two-stroke engine directly coupled to a Marelli 170-kW 220-V auxiliary dynamo and compressor capable of furnishing 9,880 cu. ft. of air per hour at 75 atmospheres. A Fiat 30-h.p. oil engine, a Marelli 18-kW 220-V dynamo, and a compressor delivering 2,294 cu. ft. of air per hour at 75 atmospheres have been installed for operating the navigation and other lights and the radio and compressed air plant in emergency.

The control mechanism is so arranged that in emergencies full speed forward to full speed astern can be effected in from 10 to 20 seconds. The total weight of the main and cognate plant is approximately 170 lb. per h.p.; with the engines developing 5,000 h.p. the vessel with a full load can attain a speed of 17 m.p.h. The foregoing particulars have been taken from a 62-page booklet compiled by Dr. Elia Migliau, which has recently been issued by Ercole Marelli & Co., of Milan, who were responsible for the electrical equipment.

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Aberdeen.—Branch offices for Halifax Building Society, Union Street; manager.

Appleby.—Electric lighting installation, Public Hall; G. H. Heelis, clerk.

Audenshaw (MANCHESTER).—Houses (228), Roker Park Estate, for A. V. M. Deane. Houses (121), Aldwyn Park Estate, for A. J. Franks.

Aylesbury.—Houses (52), Bicester Road; Stonehaven Properties, Ltd.

Ayrshire.—Extensions, Largs Higher Grade School (£8,382), for County E.C.; master of works, Ayr.

Barnsley.—Houses (796); borough surveyor.

Bathgate.—Houses (76); burgh surveyor.

Birkenhead.—Tenements (72); H. J. Rowse, architect, Martin's Bank Building, Water Street, Liverpool. Health clinic; borough engineer.

Birmingham.—Offices, Great Charles Street (£50,000), with electrical work; C. Bryant & Sons, builders, Whitmore Road, Small Heath.

Bournemouth.—Alterations, Astoria Cinema, Pokesdown; L. Morriss. Alterations, Toynbee Chambers, Firvale Road; Britannic Assce. Co., Ltd. Extensions, High School for Girls, Branksome Hill Road; governors.

Bradford.—Houses (2,000); city architect.

Bradford-on-Avon.—Houses (30), Berryfield House Estate; Manor Building Co.

Brighton.—Schools, Patcham and Whitehawk Estate; director of education.

Bromsgrove.—Houses (82); U.D.C. surveyor.

Carlisle.—Houses; J. Laing & Sons, builders, Dalston Road.

Chelmsford.—Territorial headquarters (£3,904); J. Sumner & Co., Ltd., builders.

Chester.—Houses (30), Newry Park; E. Gardham.

Chesterfield.—Houses (134); borough engineer.

Chislehurst.—Farringtons College chapel; Crickmer & Foxley, architects, 1, Lincoln's Inn Fields, London, W.C.

Cirencester.—Houses (50), Bowling Green site; F. J. Keer, builder, Coleford.

Cockenzie and Port Seton (EAST LOTHIAN).—Houses (68); J. M'Ara, architect, Cockenzie.

Coventry.—R.C. church, Harefield Road, Stoke (£5,000); priest-in-charge.

Cramlington.—Houses (40), behind Station Road; James Carruthers & Son, builders, Percy Square, Tynemouth.

Croydon.—Two blocks of flats, St. James's Road; J. Eldon Fox. Bathing pool, Purley Way (£24,000); borough engineer. Alterations and additions, Repertory Theatre, Wellesley Road; Beresford Pite & Partners.

Cumberland.—School, Brampton; county architect, 4, Alfred Street North, Carlisle.

Doncaster.—Houses (313); borough surveyor.

Droitwich.—Library, Ombersley Street; A. V. Rowe, architect, 38, Foregate Street, Worcester.

Durham.—Alterations, North Hetton Council School, for County E.C.; F. Willey, architect, 34, Old Elvet.

Edinburgh.—Hotel, cinema, bus station, and shops (£400,000), Lothian Road; J. F. Matthew, Lorimer and Matthew, architects.

Exeter.—Civic buildings (£45,000); city engineer.

Flintshire.—Central schools, Flint; R. G. Whitley, county architect, Mold.

Gloucester.—Houses (251); city surveyor.

Gravesend.—Houses, Chalk; borough surveyor.

Great Yarmouth.—Houses (120), Middleton Road; borough surveyor.

Hastings.—Aerodrome, Pebsham Estate; borough engineer.

Hertfordshire.—School, Parkway, Welwyn Garden City (£12,119) for County E.C.; C. W. Dumpleton, builder, St. Albans.

High Wycombe.—Re-erection of works, Back Lane (£6,000), for Lintafelt Works, Ltd.; H. T. Turnbull, managing director.

Hull.—Methodist church, Derringham Bank Housing Estate; Gelder & Kitchen, architects, Alfred Gelder Street.

Ilford.—Shops, Roding Lane; P. E. Brand. Boys' high school (£46,650) with electrical work; A. E. Wright, Ltd., builders, Leytonstone.

Irish Free State.—(KENMARE, Co. KERRY).—Hospital for County Kerry Board of Health; J. J. Winters and Eoghan D. Buckley, architects and consulting engineers, 27, Molesworth Street, Dublin.

Keighley.—Alterations and additions to Grove Mills, Ingrow; Robert Clough, Ltd.

Kilmarnock.—Houses (1,500); burgh surveyor.

Kimbolton.—Re-erection of Tilbrook Hall (electrically equipped) for Capt. H. Newgass.

Kintore (ABERDEENSHIRE).—Two blocks of houses; A. Marshall Mackenzie, Son and George, architects, 173a, Union Street, Aberdeen.

Lancashire.—Senior Council School, Leyland, for County E.C.; J. Turner, builder, Bamber's Yard, Preston.

Leeds.—Houses, Ivy House Estate; W. Jowitt. Buildings, Fenton Street and Woodhouse Lane; N. Ratcliffe.

Liskeard (CORNWALL).—Cinema (600 seats); Vanstone & Taylor, architects, Plymouth.

London.—(ACTON).—Flats (60), Fairlawn Park; Hearn and Chuter, architects. Flats (52), St. Catherine's School; Howis and Belcham, architects. Houses (64), Noel Street; T. Alwyn Lloyd, architect. Factories; F. E. Simpkins, architect, Park Royal Road. (BETHNAL GREEN).—Flats (230), Nag's Head Field; L.C.C. architect. (CATFORD).—Large furnishing stores, Bromley Road, for Sir William Perring & Co., Ltd., 94, High Road, Chiswick, W. (CITY OF LONDON).—Dwellings, Tupman Place (£40,000); city engineer. (CLAPHAM).—Block of flats, Larkhall Lane; Gunto & Gunton. (EALING).—Houses (42), Bennetts Avenue, &c.; A. V. Stubbs, architect. Houses (47), Rydal Crescent, &c.; A. E. Murdoch. Block of flats, Tudor Way and Carberry Avenue; A. G. S. Lyford. Houses (96), Western Avenue, &c., for London & Provincial Building Co., Ltd.; S. H. West, architect. Factory, Bilton Road; W. Clark, architect. Factories and stores, Cambridge Road; R. A. C. Churchward, architect. Factory, North Circular Road; County Perfumery Co. Factory, Wadsworth Road; R. B. J. Selby, architect. Offices and laboratories, Greenford Road; Richard Costain, Ltd. Extensions, Autotype Works, Brownlow Road; Hall-Jones & Partners, architects. Factory extensions, Waxlow Road; H. Goslett, architect. Extensions, Horsenden School, for E.C. (FULHAM).—Shops and flats, Vanston Place; E. R. Rees. (GREENFORD).—Health centre; Ealing Borough Engineer. (ISLINGTON).—Flats (109), Sebbon Street (£39,800); Gee, Walker & Slater, Ltd. (ST. MARYLEBONE).—Five blocks of flats, Wilcove Place; St. Marylebone Housing Association. (STEPNEY).—Flats, Church Row (£4,648); borough engineer.

Lowestoft.—Church, Roman Road; rector of St. Margaret's.

Luton.—Church, Beechill (£7,000); H. C. Janes, Ltd., builders.

Macclesfield.—Electricity showrooms, Poynton, for the Electric Co. of Macclesfield, Ltd., Mill Street, Manchester; J. Clayton & Sons, Ltd., builders, Sunderland Street.

Manchester.—Houses (250), Brownley Green (£85,875); city architect. Houses (35), Limdum Avenue, Stretford; Smith and Allcock, Ltd., builders, 471, Chester Road. Houses (180), Wilbraham Road, Whitebrook Road, Carrington Road, and Yew Tree Road, Withington, with electrical installations; H. M. Emery, builder, 38, Errwood Road, Levenshulme. Factory, Warwick Road South, for John Crampton & Co., Ltd., 31, Princess Street, Cornbrook. Infants' school for the managers of St. Clement's C.O.E. School, Broughton; F. Thorpe, architect, Bank Chambers, Oldham. School, Rack House site; E. Taylor & Co., Ltd.

Margate.—Reconstruction of "Dreamland," with cinema (£100,000), for Dreamland (Margate), Ltd.; Mr. Iles, managing director.

Maybole (AYRSHIRE).—Houses (40); burgh surveyor.

Middlesborough.—Houses (394); S. E. Burgess, borough engineer, Town Hall.

Mitcham.—Additions, Empire Works, Mitcham Road; S. H. Palmer.

Newbury.—Houses (160), Pinchington Lane, for C. Haysom; Louch Belcher & Co.

Newton Abbot.—Houses (24); Coles & Squires, builders, Torquay.

Oldham.—Lift and gangways, Boundary Park Hospital; C. T. Taylor, Roberts & Bowman, architects, 10, Clegg Street.

Padiham.—Council offices and public hall; U.D.C. surveyor.

Penrith.—Houses (24), Musgrave Street; Baines & Sons, Ltd.

Peterborough.—Extensions, Memorial Hospital (£4,800); F. A. C. Taylor, secretary.

Preston.—Dock offices, Watery Lane; borough surveyor.

Rotherham.—House and business premises for E. Havenhand, Browning Road; A. J. Pugh, builders, Kilnhurst Road, Rawmarsh.

Rugeley (STAFFS).—Houses (50); U.D.C. surveyor.

St. Neots (HUNTS).—Houses (20), The Crescent; U.D.C. surveyor.

Saffron Walden.—Houses (42); borough surveyor.

Salford.—Offices (£15,000), Pendleton; city engineer.

South Shields.—Additions to Harton Hospital, West Harton, with electrical work; Henderson Bros., builders, Smith Street, Tyne Dock.

Southend-on-Sea.—Houses (122), Leigh Estate, and police station (£3,350), Shoeburyness; borough engineer.

Southport.—Fire station extensions (£2,171); Buck & Hudson.

Spalding.—Hospital nurses' home; Webster & Trower, architects, Station Street.

Stirling.—Block of shops and houses, Drip Road, for R. L. Ballantyne.

Stockport.—Houses (136), Adswood, with electrical installations; Thomas Davies & Sons, builders, Clwydd Avenue, Edgeley.

Sunderland.—Houses, Newcastle Road, Millbank and Charlton Road; J. W. Ridley, Ltd., builders, Park Lane. Flats (64) and houses (26), Leechmere Road; T. P. Collinge, borough engineer. Cinema (1,250 seats), Ryhope Road; G. F. Hill, Marsden Road, Cleadon, South Shields.

Swansea.—Houses (54), Townhill; S. Davies.

Todmorden.—Senior school, Walsden, for E.C.

Tonbridge.—Reconstruction of station (£95,000), for the Southern Railway Co., Ltd. Houses (40); R.D.C. surveyor.

Tunbridge Wells.—Houses (180), Ferndale Park Estate; W. T. Burrows & Sons, builders, Maidstone.

Watford.—Houses (48), North Western Avenue; Kempster & Williams. Shops and flats, High Street; Mr. A. B. Cox.

Wembley.—Houses (150), Alperton; C. R. W. Chapman, engineer and surveyor. Council Offices, Extensions, East Lane school (£7,368); A. & B. Hanson, Ltd.

Weston-Super-Mare.—Houses (48), Bournville Estate; Sealey and Gibbs, builders.

Wombwell.—Houses, King's Road Estate; U.D.C. surveyor.

Worcester.—Junior school, Tunnell Hill, for E.C.; A. Parker, architect, The Avenue, Cross.

Worthing (SUSSEX).—Houses (32), Flecher Road; S. Willmore Phillip & Co., builders, 26, Chapel Road. Houses (20), Hurst Avenue; A. W. Clements, builders, Lenton, Marine Parade.